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THE
NATURALIST:

A
MONTHLY JOURNAL OF

Natural History for the North of England

EDITED BY

W. H. PEARSALL, D.Sc., F.L.S., and W. R. GRIST, B.Sc.,
THE UNIVERSITY, LEEDS.

with the assistance as referees in special departments of

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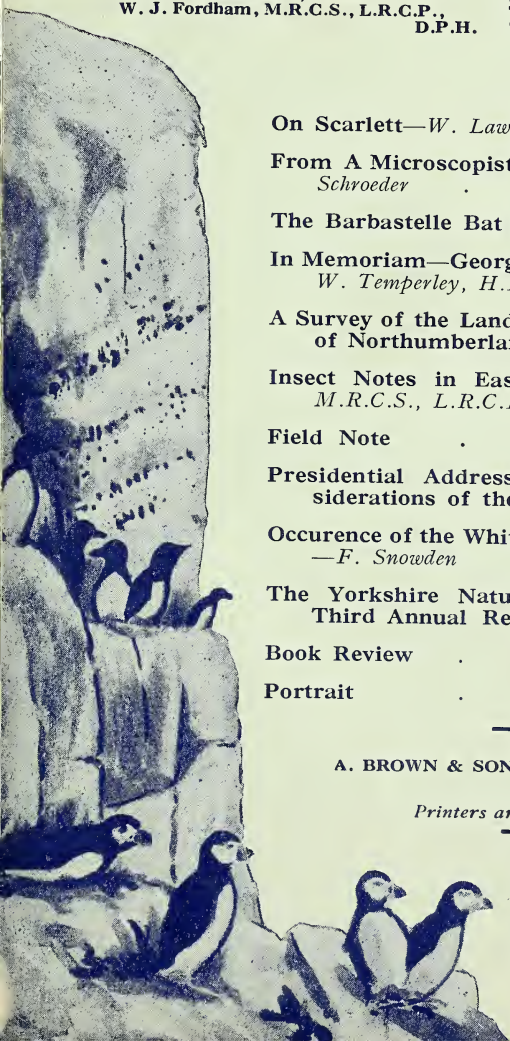
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THE NATURALIST

FOR 1935

ON SCARLETT

W. LAWRENCE SCHROEDER

In this bewitching corner of the world
 Which thrusts out timidly into the sea,
 Upon whose shores, the waters, finely curled,
 Caressingly applaud its modesty—
 Among the lichened rocks I sit and dream,
 And call up images of days long past :
 Beyond the broken edge, the waters stream
 Forgetful of the winter's shrieking blast,
 Chanting in dim low notes a wondrous song
 Of sorrows that once were, and are no more,
 Of hopes that now may challenge ancient wrong
 With sweet assurance born of God's own lore.

Amid these tortured shapes that once did meet
 The steady onslaught of the moon-led tides,
 But now uplifted are, above the beat
 Of all the varied force that subtly hides
 Within the moving waters, sit I here
 And ponder on the way of life—the road
 Whereby I've travelled, hardly, year by year ;
 Oft times nigh sinking underneath the load,
 But inwardly sustained by the glad thought
 That one day I, too, would be raised above
 The steady wearing strain that brings to nought
 So many dreams born of a simple love.

The day has subtly changed : so long my mind
 Has moved among the things of long ago,
 That time has been forgotten : winds less kind
 Ruffle the surface of the deep : the flow
 Has lost its music : a discordant note
 Now sounds : and something of the ancient dread
 Revives within my heart : before me float
 The shades of hopes, once vital but now dead :
 A feeling of the impotence of life
 To free itself from grim, dull stifling care
 Moves subtly in my soul : the old grey strife
 Revives : shall I not be with those that dare,
 With those that struggle to the very end,
 Accepting blithely what the gods do send !

FROM A MICROSCOPIST'S NOTE-BOOK

W. LAWRENCE SCHROEDER

IN tubes of *Vaucheria*, taken in the month of January, I found eggs of the rotifer *Pisales werneckii*, which conditions the formation of galls. Some of these were irregularly protuberant. In one filament of the alga, and fairly close together, I counted thirty eggs. Some of the embryos were quite lively: the movement in the egg was at times relatively quick. The eggs were in different stages of development. Of the more advanced, four seemed to be in the same phase of development. The red eye-spot of the rotifer is like a plano-convex lens.

Occasionally the inhabitants of a life-slide seem to enter sympathetically into the desires of the microscopist. I was examining a diatom, *Pinnularia viridis*, and wishing that I could manipulate the slide so that I could see the plant in every aspect. A fussy little ciliate came along—one of the *Euplotes*—and barged into the diatom, turning it round so that my heart was satisfied with the views. Such an infusorial 'good turn' is not unworthy of record.

It is commonly said that the fresh-water shrimp—*Gammarus pulex*—demands running water for its perfect happiness. Well, it has bred in my jars—in November—and I have had the creature in all stages, from that of baby to adult. The jars are occasionally aerated with a pipette; but they may go for weeks without such service and yet maintain a thoroughly healthy condition. Much, of course, depends on the plant life therein: I prefer a preponderance of algæ. November is not supposed to be the best month for pond-life collecting. Yet in one year and another I have been richly rewarded for chilled toes and almost frozen fingers, as in a bitter wind I have swept the lower levels of a farm pond in the Shibden Valley. I remember one year when the snow was on the ground, and the ice on the pond was an inch thick. The air was suggestive of an Antarctic blizzard. We broke the ice, and shoved the bottle in and about the floating fragments, but with little result. The *Elodea canadensis* had sunk to the bottom. We hauled up some decayed leaves, with the delicious sliminess upon them, that sends the authentic thrill through the pond-life collector. The examination that night compensated for an almost frost-bitten ear. *Cyclops* and the spined *Daphnia* were in good number; *Coleps hirtus*, the barrel *animalculum*, rolled its merry way over the slide; *Chaetonotus larus* sped swiftly from side to side; various rotifers, including *R. vulgaris* and *Diglena catellina*, lent distinction to the company; an odd

Euglena viridis squirmed its way among the smaller algæ, as if apologetic for its behaviour; *Stentor raeselii*, the trumpet *animalculum*, in dignified reserve, kept to a restricted portion of the material; while *Amoebæ* moved with insinuating grace among diatoms—mainly very small *Naviculæ*—and some of the spherical unicellular algæ. The diatoms *Cocconeis pediculus* and *Gomphonema constrictum* were found epiphytic on filamentous algæ.

The most cheering find was a bunch of *Amthophysa mülleri*: at the end of a lightish brown, somewhat nodular stalk was a cluster of twenty-eight individuals, each about $\frac{1}{2400}$ in. long, with a very active flagellum about $\frac{1}{1800}$ in. long. Colonies of clusters intensified my joy.

After all, November has its charm with such treasures of delight.

THE BARBASTELLE BAT IN YORKSHIRE

E. W. TAYLOR

WHILE walking in Castle Howard Park on November 25th a dead bat was observed on the side of the road, and a casual examination indicated that it was not one of the common local species.

The dark mole-coloured fur and the complex appearance of the ears, which met above the forehead, pointed at once to the Barbastelle, and measurements were taken for comparison with those given in Barrett-Hamilton's *British Mammals*. These are given below, following the measurements of a female in the flesh obtained from the above source:

	mm.	mm.		mm.	mm.
Head and body	51	50	Forearm	41	38
Ear, greatest length	13.5	15.0	Thumb, without claw	4.0	4.0
Tragus, greatest length	9.0	8.0	Largest digits	67.0	66.0
Tail	54.0	40.0	Metacarpal III	37.0	35.0
Lower leg	20.0	20.0	Metacarpal V	35.9	35.0
Hind Foot (without claws)	7.0	6.0	Greatest wing expanse	268	260

The specimen was forwarded to the British Museum (Natural History) and there identified as an adult female Barbastelle. It is the most northerly specimen received there, though the species was recorded from Carlisle prior to 1886. It is being retained at South Kensington as a spirit specimen for the National Collection.

In Memoriam

GEORGE BOLAM

8th November, 1859—25th October, 1934.

FOR twenty years the little town of Alston, in the East Nook of Cumberland, has been the adopted home of George Bolam, the naturalist ; and there, on the 29th of October, 1934, he was laid to rest amongst the enfolding hills.

His active figure was familiar far and near on the wide



fells of South Tynedale, where he was known and respected by all. Strangers, meeting him upon the moors, might have taken him for a local shepherd as he strode by, with his swinging and tireless gait. His weather-beaten face and grey beard, the iron-shod pole, which he always carried, and the Border terrier at his heels, completed the illusion. When, however, he paused to exchange a greeting, his quiet, cultured voice proclaimed him other than a native of Tynedale ; while the field-glass slung about his neck, proved that his

interests were not confined to sheep. To accompany him over the moorlands or along the river-valleys was to enter a new world of unsuspected interest and beauty, where, under his interpretation, every sight and every sound revealed some fresh aspect of wild life.

George Bolam was born in 1859 at Barmoor, near Wooler, was educated at Uppingham School, and began his career as a land agent in partnership with his father at Berwick-upon-Tweed. A keen sportsman in his early days and an expert fisherman all his life, he soon became familiar with every nook and cranny of his native Borders. His love of birds was always greater than his interest in shooting ; and, even in early life, he laid aside the gun and took up the field-glass. He soon became a recognised authority on the bird life of the Borders and the North East Coast, and later his observations extended further afield, both at home and abroad. Two summers in Lapland and a long sojourn in Southern Spain provided opportunity for further study. Throughout his life his absorbing interest lay in observing and recording the habits of birds and beasts. His long series of manuscript notebooks, meticulously indexed, is a rich storehouse of personal observations and experiences, interspersed with drawings, extracts, and references. He was never a collector for collecting's sake. Such specimens as he obtained in the course of his investigations into the bird life of the district are now in the Hancock Museum at Newcastle-on-Tyne. He was always averse from the unnecessary shooting of birds and the taking of eggs, and several of his notes in ornithological publications were written to protest against acts of destruction, particularly against any senseless and wasteful slaughter undertaken ostensibly ' in the cause of science.'

As a writer his best-known work is *The Birds of Northumberland and the Eastern Borders*, published in 1912, and now, unfortunately, out of print and hard to come by. In addition to being an accurate and exhaustive catalogue of local birds, this book is packed from cover to cover with fascinatingly interesting personal reminiscences, anecdotes and local folklore relating to birds. His other well-known volume, *Wild Life in Wales*, published in 1913, vividly describes his observations and experiences with birds and beasts during three seasons spent in the remoter fastnesses of central Wales.

In 1931 he was invited by the Natural History Society of Northumberland, Durham, and Newcastle-on-Tyne, of which he was an honorary member, to compile a Catalogue of the Birds of Northumberland for publication in the *Transactions of the Society*. This catalogue (*Trans. N.H.S., New Series, Vol. VIII*) brings the knowledge and recorded history of the bird life of Northumberland up to date and is a worthy

successor to that published in 1874 by John Hancock, the friend and colleague of his youth.

As a member of the Berwickshire Naturalists' Club, George Bolam was a frequent contributor to the Club's *History*, and had only recently completed in its pages an exhaustive catalogue of 'The Lepidoptera of Northumberland and the Eastern Borders,' based upon observations and notes extending over many years.

He contributed many interesting papers to *The Vasculum*, of which magazine he was one of the assistant editors, as well as to other periodicals. His best-known contribution to *The Naturalist* was a paper on 'Notes on the Natural History of Hornsea Mere' (*The Naturalist*, 1913, pp. 33-71). A paper on Temminck's Stint, published in the issue of November, 1934 (*The Naturalist*, 1934, pp. 243-5) and appearing a few days after his death, bears witness to his exceptional powers of observation and description.

He was one of the few recognised authorities on the British bats, of which he had long made a careful study. His knowledge of plants was also extensive. He knew intimately the habitats of all the local species around Alston and along the Borders, and in his rock-garden he grew successfully most of the local ferns and rock-plants, besides many arctic and alpine species. His expert knowledge of fish and of the waters of South Tynedale made him a valued member of the Tyne Salmon Conservancy Board, and he published a brochure on *The Fishes of Northumberland and the Eastern Borders*.

He died at his desk: suddenly, unexpectedly. In the midst of his many activities he passed away, without illness or infirmity, in the little house below Tyne Bridge where he had lived for so many years with his devoted sister, Miss E. S. Bolam. The death of this grand old naturalist has bereft nature-lovers and ornithologists of a valued colleague and deprived wild life of a sympathetic interpreter and faithful guardian. The beautiful lines of Burns' 'Elegy' were never more appropriate:—

"Mourn, ye we songsters o' the wood;
Ye grouse that crap the heather bud;
Ye curlews, calling thro' a clud;
Ye whistling plover;
And mourn, ye whirring pairrick brood;
He's gane for ever.

GEORGE W. TEMPERLEY.

[George Bolam will be best remembered by the members of the Y.N.U. as having acted as our bird-watcher at Hornsea Mere for the season of 1912, and during the Bearded Titmouse experiment. His very full report was published in *The*

Naturalist for 1913, and afterwards issued in pamphlet form. For four years (1908-1912) he lived in Ilkley, where his chief work, *The Birds of Northumberland and the Eastern Borders* was written. He was very adverse to the ever-changing scientific nomenclature. Formerly he contributed notes to *Country Life* and other papers under the *nom de plume* of 'Lichen Grey.' For twenty years, and up to the time of his death, he was a member of the Bradford Natural History and Microscopical Society. He was a widower and leaves one son.—H.B.B.]

A SURVEY OF THE LAND AND FRESHWATER MOLLUSCA OF NORTHUMBERLAND AND DURHAM

MR. E. PERCY BLACKBURN is to be congratulated on his recent publication, *A Survey of the Land and Freshwater Mollusca of Northumberland and Durham*. It is a very real pleasure to read and must have given the author an almost endless amount of labour to compile. It is most valuable to workers who are interested in Conchology and will prove a great help to them.

Mr. Blackburn divides up the two counties into eleven areas, describing each one and stating if mollusca are to be found there or not.

It is with rather a shock we read that *L. peregra* is not common and that 'rarer species such as *L. stagnalis* have, however, gone.' In Yorkshire we have always looked on these species much as we should *Pyramidula rotundata*, very common, that is to say the type forms, any piece of water producing them.

The detailed account of habitats of each species must have taken much time both in the tabulation and the remarks are very good. As in Yorkshire the two forms of *Vivipara* seem to be rare; if it was possible to give protection to some molluscs, such as is given to the vertebrates, we might hope to save them from extinction.

INSECT NOTES IN EAST YORKS

W. J. FORDHAM, M.R.C.S., L.R.C.P., D.P.H.

THE following notes on times of appearance of some common insects may be of interest to entomologists generally, and refer to the past season 1934.

The cluster fly, *Pollenia rudis* F., first put in an appearance in the house on 14th January. This is a sluggish fly and one of the first to appear. It is often abundant prior to hibernation. The larva lives in humus and dung, and is said to prey on earthworms. On the 15th and 22nd January appeared swarms of the winter gnat, *Trichocera* sp. These swarms were in great numbers, and consisted of from a dozen to sixty individuals. Two tortoiseshell butterflies, *Vanessa urticae* L., were seen in the garden on 25th March, having emerged from hibernation. This species did not appear in 1933 till 5th April. By the 17th April, 1934, it was not uncommon. 30th April saw the appearance of the red female

of the bee, *Andrena fulva* Schr., one on Aubretia and one on a house window. The same day the bee, *Halictus rubicundus* Chr., was abundant about burrows in the flower beds. On 4th May the small housefly, *Fannia canicularis* L., appeared in the house, and was common by the 10th. This was a month later than its appearance in 1933. The same day blow-flies, *Calliphora* spp., were common in the garden. May 8th saw the first Herald moth, *Gonoptera libatrix* L., and on the 11th of the same month several examples of a species of *Ophion* (Ichneumonidae) were taken on windows in the school house. *Syrphus ribesii* L. put in an appearance the same day on Allerthorpe Common, being not uncommon on dandelions and hovering in the air. The same day also the orange-tip butterfly, *Euchloe cardamines* L., was taken in the garden. On 27th May the celery fly, *Acidia heraclei* L., was very common on raspberry leaves, together with a small *Crabro*. At Frog Hall on 31st May occurred several of the skipper butterfly, *Nisionades tagus* L., and the orange-tip was by then common. On hawthorn were the beetles, *Lochmaea crataegi* Forst. and *Meligethes lumbaris* Sturm., the latter a local species new to East Yorks. The asilid fly, *Lasopogon cinctus* F., was not uncommon on sandy parts of the common.

By 8th June the first cockchafer, *Melolontha vulgaris* L., had appeared, and on the 23rd of the same month the Forster moth, *Ino statiles* L., was abundant at Frog Hall on the dwarf willow, and larvae of *Panolis piniperda* Panz. were common on the Scots pine on Allerthorpe Common.

On 24th June the larvæ of the Mullein moth, *Cucullia verbasci* L., were abundant on *Verbascum* in the garden, and about the same time the moth, *Xylophasia monoglypha* Hufn., was extremely abundant in the house, together with an example of the melanic form *infuscata*. By 6th July the stable fly, *Stomoxys calcitrans* L., had appeared, and later in the year indulged its blood-sucking propensities until well into October. The first Red Admiral butterfly, *Vanessa atalanta* L., was seen on 10th July. A hibernated example was seen on 27th March, 1933, in the village. Later in the year this butterfly became rather numerous on flowers of *Buddleia*. The gold-tail moth, *Porthesia chrysorrhoea* L., was extremely abundant on the night of 12th July.

The sand-loving chafer beetle, *Serica brunnea* L., put in an appearance on 14th July in the water butts, and 23 examples were taken up to 30th July. Last year 20 were taken from 24th June to 19th July. In 1932 69 occurred between 12th July and 5th August, while in 1931 there were 70 taken from 6th July to 8th August. The times of appearance and numbers on the wing at night therefore vary rather widely in different years. On 12th September at 4 p.m. (summer time) occurred a large swarm of the fly, *Musca autumnalis* De G. (*corvina* F.) on the inside of a house window facing south. Females predominated, but, unfortunately, I did not take a count. The numbers, however, in swarms in previous years are as follows: 1933, 26th August, at 5 p.m., 66 males and 76 females, and 1932, 15th September, at 6-30 p.m., 36 males and 102 females.

Unless otherwise stated the locality for the above-mentioned insects is Barmby Moor, East Yorks.

Reddish Grey Bat and British Willow Tit.—In *The Vasculum* for November the late G. Bolam records the first Reddish Grey Bat (*M. nattereri*) ever taken in Northumberland. It was picked up dead on the morning of August 16th at Catcleugh. In the same journal Mr. G. W. Temperley gives some details of a pair of British Willow Tits (*P. a. kleinschmidti*) that nested in Ravensworth Park, Durham, in 1934.

SOME ECOLOGICAL CONSIDERATIONS OF THE FUNGI¹

F. A. MASON

It is perhaps not inappropriate on this occasion that my address should take the form of some notes on an aspect of field mycology stimulated by a long association with my colleague in the Secretariate of the Yorkshire Naturalists' Union, Dr. W. H. Pearsall. It is an acknowledgement I am glad to be able to make, when I say that about ten years ago, after some discussion on the subject of fungus relationships, Dr. Pearsall furnished me with a Table of Vegetational Types which he thought might be useful in connection with records of the fungi. The Table has proved useful, and it suggests the considerations which I now place before you.

Most of you are aware that for many years I have been collecting and recording fungi in Yorkshire. Occasionally I have had opportunities of visiting other counties not so well-known to me, and for six or seven out of the last ten years I acted as leader of the annual Fungus Foray held by the Derby Railway Natural History Society. The members of that Society have always been enthusiastic in the field study of the fungi and several of them are experienced collectors. In the usual routine of the Foray the members go out either singly or in small groups to the woods at Coxbench and other places in the neighbourhood of Derby, in order to cover as large an area as possible in the course of an afternoon. In the evening the proceeds are pooled for identification. On one occasion it was not possible for me to be present at the excursion although I expected to attend in the evening, and as there was to be a discussion on fungus relationships, I asked that each member's gatherings should remain in the baskets until I had an opportunity of looking through them. On the strength of my observations in Yorkshire it was possible, with few exceptions, to place the specimens in order according to the types of vegetation among which they had been collected. In one instance it was obvious that a member had first worked a Birch wood and having grown tired of the abundance of a few species, had walked out into the fields by way of a Larch plantation. After a really good time among the white, pink and black-spored toadstools of the fields he had finished up in a coniferous wood. His vegetational excursion is outlined on the table of plant associations to which reference has been made.

It is quite likely that any other field mycologist would have arrived at similar conclusions, and I use the experience to illustrate, firstly, that definite associations of the fungi with their vegetational environment exist; and secondly, that the vegetational types of the phanerogamic botanist furnish a basis for a more informative method of tabulating records of fungi than that in which their systematic arrangement is employed.

Although it is a comparatively simple matter to record fungi on the lines suggested, it is a vastly more difficult thing to attach any significance to their occurrence in a particular habitat. The fundamental difference between the fungi and the higher plants that renders them dependent upon organic material for energy and nutrition introduces complications not experienced in determining woodland or other types of phanerogamic

¹ 'Some By-paths in Mycological Study.' Presidential Address to the Yorkshire Naturalists' Union, Bradford, 8th December, 1934. These notes were followed by a popular account of household mycology and fungi in industry, commerce and disease, in illustration of the part played by man as a biotic factor in the distribution of the fungi.

vegetation. The phanerogamic botanist is not interested in the dead plants of an association further than discovering the cause of death, but a fungus flora of a wood is influenced by the presence of both the living and the dead trees and plants.

TABLE OF TYPES OF VEGETATION.

MOORLAND CONDITIONS : High rainfall, lower temperatures, greater evaporation, poor soil.

M.1.	Cotton Grass (<i>Eriophorum vaginatum</i>)	Wet.
M.2.	Heather (<i>Calluna vulgaris</i>)	} Drier types.
M.3.	Rough Pasture	
M.4.	Rushes (<i>Juncus</i> sp.)	Wet-fresher water.

WOODLAND CONDITIONS :

	<i>Oakwood</i> (often much planted).	
O.1.	} Bilberry (<i>Vaccinium Myrtillus</i>). Hair-grass (<i>Deschampsia flexuosa</i>).	} Birch. >
O.2.	} Bracken Bluebell. Soft-grass.	} Holly.
O.3.	Dog's Mercury (<i>Mercurialis perennis</i>)	Ash.
O.4.	Meadow-sweet (<i>Spiraea Ulmaria</i>)	Elm-Alder.
A.	Alder-Willow woods (very wet)	
B.	Beech Plantations—little ground vegetation.	
C.	} Coniferous „ „ „	} Larch
		Fields with grazing animals

FARMLANDS :

- P. Permanent Pasture.
F. Land under crops.

When a toadstool is found growing in a wood somewhere between a living tree and a dead stump it is by no means easy to decide whether it is associated with either of them or with neither. If it is *Hypholoma fasciculare* it is most likely coming from the stump ; if it is *Boletus elegans* it is possibly growing symbiotically with the tree, which in that case is almost certain to be Larch ; or again, if the fungus is *Armillaria mellea* it may be supported equally well by tree or stump. Alternatively, the fungus may have neither relationship nor even remote association with the tree or stump, and it may be growing on a decaying twig of some other kind of tree or shrub, as would *Mycena sanguinolenta*, and *Marasmius ramealis* for example. In the latter instance the dead twig on which the fungus grows would be likely to have some

antecedent connection with the woodland vegetation, while alongside it might be growing a specimen of *Stropharia semiglobata*, a coprophile, which may be found in every one of the vegetational types because of the widespread use of farm animals. Furthermore, fungi like the Pezizas and Morels grow from the soil without any visible or traceable connection with plant remains.

Relationship is less difficult to recognise when a fungus is found on a tree, but even then the kind of relationship is not always obvious. It may be growing on the living tissues as a true parasite, as instanced by *Fomes annosus* on Larch, *Fomes applanatus* on Beech, *Polyporus squamosus* on many trees, deciduous and coniferous alike, or it may be a saprophyte like either *Crepidotus mollis* or *Stereum rugosum*, flourishing on parts which have suffered pathological or mechanical injury and no longer function as living tissue. A tree decorticated by a lightning flash leaving a long vertical strip of exposed wood often becomes tenanted by a mixed flora of parasitic and saprophytic fungi. The base of the living tree may support growths of *Mycena tenerrima*, a saprophyte capable of developing upon a little humus produced by the growth of mosses in the corrugations of the bark, and in that case the tree would only be a carrier.

In giving a name to a woodland or moorland type of vegetation, the ecologist is assisted by the relative permanence of the units of vegetation, and it is possible to say on inspection what is the dominant plant in any one of the three or four strata that may be used for the purpose. The fungi are so peculiarly seasonal in their appearance and so evanescent when they do appear that it is difficult to decide what species is to be regarded as dominant in any given association. It is not necessarily that species which occurs in the greatest profusion at any given time of observation. It is more likely than not that three or four observers examining a wood at monthly intervals from August to November would arrive at as many different conclusions in regard to dominance. If, however, these several observers investigated the same wood throughout the period mentioned, my own experience suggests that they would reach a unanimous conclusion as to some few species that might be regarded as characteristic of the wood, and perhaps find one or two to which the term 'indicator' might be applied, so constant is their appearance in relation to vegetational environment. I prefer the word 'indicator' rather than 'dominant' because of the confusion to which use of the latter word might lead if it were allowed to interpret profusion rather than character.

It sometimes happens that the 'indicator' species does occur in abundance, but the danger of allowing numerical preponderance of one species over another to be interpreted as having 'indicator' value will be appreciated by anyone who has seen the vast numbers of *Hypholoma fasciculare* or *Armillaria mellea* that will dominate a wood for months at a time. They characterise nothing but the tree, plant or stump on which they may be growing, and *Armillaria mellea* may be found on a great number of plants of widely different genera, including herbaceous plants and cultivated crops.

The fungi to which I would restrict the term 'indicator' species or even regard as being in any way characteristic of a vegetational type are all species which have a mycelial system in the soil, as do the boletes, many agarics and puffballs. Species growing on trees are not 'indicators' in the type-vegetation sense; *Polyporus betulinus* is characteristic of the Birch, and in Yorkshire, *P. hispidus* is apparently confined to Ash. A group of fungi including *Polyporus betulinus*, *Mycena galericulata* and *Dacryomyces deliquescens* might suggest collection in a suburban garden, and the *Polyporus* would be an unsafe 'indicator' from the vegetation viewpoint. On the contrary, *Mycena galericulata*, *Dacryomyces deliquescens*, *Boletus scaber*, *Lactarius turpis*, *Amanita*

rubescens and *Amanitopsis vaginata* would indicate a Birch wood without having recourse to the *Polypore*, and without either the first two or the last two species, because, although so frequently present, they belong to the overlapping category to which I will refer in a moment.

If in addition to the last series of fungi, *Boletus elegans* and *Lactarius rufus* occurred it would in my experience represent with the greatest degree of certainty an area once dominated by Birch and now planted with Larch.

Overlapping of species occurs in the different phanerogamic vegetational types, but it sinks into insignificance compared with the overlapping of fungi from one type to another. The number of species of fungi that may be regarded as characteristic likely to be recorded within any vegetational type is always infinitesimally small compared with the number found overlapping; the overlap may cover so wide a range as to include all four Oakwood types, and A, B, and C as well. It would appear as though I am urging reasons against any useful purpose being served by recording fungi vegetationally, but what I desire to do is to emphasize the necessity for caution in attaching significance to any one or all the species of fungi found in any particular type of vegetation. It is equally necessary to recognise the fact that two widely different lists of fungi may be drawn up for any one given plant association by two observers. The discrepancy must not be regarded as the result of error in either observation or identification, but as corroborative evidence of the impossibility of any single observer being able to make a faithful and complete picture of the fungus flora of his district.

If the work of field naturalists and mycologists were recorded in the way I suggest, it would in time, I think, reveal a greater number of 'indicator' species than those which can now be so regarded. It is probable that all those fungi which may be placed as 'indicator' species are likely to prove of greater interest and importance than could have been thought possible twenty years ago. More than twenty years ago in the Birch woods of Adel and Alwoodley, near Leeds, I found that *Boletus scaber* was the most characteristic, although by no means the most prolific fungus. I soon learned to associate *Boletus elegans* with Larch in the same way, and have searched for a Larch stump successfully when a single specimen of the *Boletus* was found in places far away from growing Larch trees. When I made use of those two *Boleti* and a group consisting of *Boletus bovinus*, *Gomphidius glutinosus* and *Clitocybe aurantiacus* as 'indicators' of the vegetational types traversed by my Derby naturalist friend, I was possibly employing as perfect a means of identification as any of the usually accepted botanical characteristics of the Birch, Larch and Pine, respectively, could furnish.

During the last fifteen years a great deal of research has been proceeding with reference to the fungus tissue formed in association with tree roots known as mycorrhiza. The work of Dr. M. C. Rayner is well known, and practically everything one might say on the subject of mycorrhiza has been said by Dr. Rayner, either as the result of her own researches or in the valuable reviews of the work of others. During the last ten years Dr. E. V. Laing, the present head of the Forestry Commission, has been actively engaged in the investigation of relationship of mycorrhiza to forest trees, and his results, particularly with regard to those dealing with the growth of tree roots in peat must be of special interest and value to Yorkshire foresters. Mr. J. Ramsbottom's illuminating work on the mycorrhiza of orchidaceous plants is equally well-known.

The occurrence of mycorrhiza in association with roots in woodland and moorland soils is common and may be observed with the naked eye. I can show by means of lantern slides the appearance the mycorrhiza gives to the rootlets of a plant. A seedling Birch is a good subject for examination so long as care is taken in removing it from the soil, as the

mycorrhiza mantle is easily stripped from the tips of the rootlets, but as will be seen from the photographs, Mountain Ash and Holly seedlings show the mycorrhiza quite well. Alternatively the growths may be seen by turning up the turf at the roots of trees, when they will be found in profusion.

The thickened and forking tips of the lateral rootlets represent a mantle resulting from mycorrhizal growth. This consists mainly of masses of exterior fungus hyphæ which, in the present instance, are sometimes called *ectotrophic* mycorrhiza, as distinct from the *endotrophic* form in which the hyphal masses occur within the cells. Dr. Rayner has pointed out that such separation is artificial, and that the rootlets of certain trees, including the Birch, exhibit both the intracellular and the external mantle types of infection. It is therefore termed an *ectendotrophic* mycorrhiza. *Ectotrophic* mycorrhiza growths give rise to types of hyphal masses which may be described as *coralloid* mycorrhiza and *ball* mycorrhiza respectively. The Birch root mantle represents the former type, while the *ball* mycorrhiza occur frequently on Pine rootlets, as described by Laing.

There is an accumulation of evidence which points to the mycorrhizal relationship of a large number of the common toadstools of our fields and woods, and again in this direction field naturalists can assist in the work of obtaining more definite information regarding this type of relationship by recording the occurrence of the fungi and the vegetation with which they are associated.

In an earlier paragraph I have used a phrase implying the symbiotic relationship of a fungus, *B. elegans*, to a tree, but the proofs in regard to the parasitic or symbiotic nature of mycorrhiza are still lacking. It has been found that in the presence of normal mycorrhizal association, the tree benefits, as indicated by the healthy condition of the roots, and it is known also that the normal mycorrhiza may be replaced by the pseudomycorrhiza—the hyphal filaments of other soil fungi which have an adverse effect on the health of the tree. The true mycorrhiza when present appear to protect the roots from attack by destructive invading fungi of other kinds.

Recent work in Japan by T. Asai¹ suggests that the mycorrhizal habit is almost universal in its occurrence. In researches concerning an enormous number of plants, Asai claims that 82 per cent. of the plant families examined by him show the presence of endotrophic mycorrhiza. The plants examined include ferns, conifers, deciduous trees, wild and cultivated plants and grasses. It is concluded that mycorrhizal association is a common feature of all land plants, and it is only suppressed when the plants are grown in water. Asai holds the opinion that the host and the fungus both benefit from the association.

Furthermore it has been shown that there may be multiple mycorrhizal associations, and that a number of different species of fungi are able to form mycorrhiza on one species of tree. To that fact, no doubt, may be traced the discrepancies which occur in the fungi recorded by different observers regarding the association of certain species with any one tree, especially in widely separated countries where climatic and other factors may be more favourable to one species than to another. Peyronel, studying this subject in Italy, and Melin working in the forests of Sweden, have published lists of fungi which have been traced to mycorrhizal association with forest trees, and these are tabulated below. I think it will be found as knowledge accumulates that those fungi I should call 'indicators' from field observation will prove to be species living in mycorrhizal association with certain trees, and have a diagnostic value not previously suspected.

¹ *Jap. Journ. Bot.* 1934, VII, pp. 106-150.

	MELIN				PEYRONEL
<i>Betula alba</i>	<i>Boletus scaber</i>				<i>Boletus scaber</i>
	<i>B. edulis</i>				<i>Amanita muscaria</i>
	<i>B. rufus</i>				<i>Amanitopsis vaginata</i>
	<i>Tricholoma</i>				<i>Tricholoma</i>
	<i>flavobrunneum</i>				<i>flavobrunneum</i>
					<i>Lactarius necator</i>
					<i>L. torminosus</i>
					<i>Scleroderma vulgare</i>
					<i>Russula rhodoxantha</i>
<i>Corylus avellana</i>	...	...	...	...	<i>Lactarius Coryli</i>
					<i>L. subdulcis</i>
					<i>Boletus chrysenteron</i>
					<i>Strobilomyces</i>
					<i>strobilaceus</i>
					<i>Hypochnus cyanescens</i>
					<i>Amanita rubescens</i>
					<i>Rhodopaxillus nudus</i>
					<i>Cortinarius proteus</i>
					<i>C. multiformis</i>
					<i>C. violaceus</i>
					<i>Hydnum repandum</i>
<i>Fagus sylvatica</i>	...	...	...	...	<i>Cortinarius proteus</i>
					<i>C. bivelus</i>
					<i>Boletus cyanescens</i>
					<i>B. chrysenteron</i>
					<i>Hypochnus cyanescens</i>
					<i>Scleroderma vulgare</i>
					<i>Amanita rubescens</i>
					<i>Lactarius subdulcis</i>
					<i>L. blennius</i>
					<i>Russula emetica</i>
					<i>R. nigricans</i>
					<i>Cantharellus</i>
					<i>infundibuliformis</i>
					<i>Hydnum repandum</i>
<i>Populus tremula</i>	...	...	...	...	<i>Cortinarius collinitus</i>
<i>Quercus robur</i>	...	...	...	...	<i>Amanita citrina</i>
					<i>Lactarius subdulcis</i>
					<i>Russula cyanoxantha</i>
<i>Castanea vesca</i>	...	...	...	...	<i>Amanita rubescens</i>
					<i>Russula lepida</i>
					<i>R. rubra</i>
					<i>Scleroderma vulgare</i>
<i>Larix europaea</i>	<i>Boletus elegans</i>				
	<i>B. luteus</i>				
	<i>B. variegatus</i>				
	<i>Amanita muscaria</i>				<i>Amanita muscaria</i>
	<i>Cortinarius camphoratus</i>				<i>Russula laricina</i>
	<i>Tricholoma psammopus</i>				<i>Hygrophorus Bresadolæ</i>
					<i>H. lucorum</i>
					<i>Scleroderma vulgare</i>
					<i>Lactarius rufus</i>
					<i>Gomphidius gracilis</i>
					<i>Paxillus lateralis</i>

	MELIN	PEYRONEL
<i>Larix occidentalis</i>	<i>Boletus elegans</i> <i>B. luteus</i>	
<i>Picea excelsa</i>	<i>B. luteus</i> <i>B. variegatus</i> <i>Amanita muscaria</i> <i>Lactarius deliciosus</i> <i>Russula fragilis</i> <i>Cortinarius mucosus</i>	
<i>Pinus montana</i>	<i>Boletus granulatus</i> <i>B. variegatus</i> <i>Lactarius deliciosus</i> <i>Tricholoma virgatum</i> <i>Russula fragilis</i> <i>Cortinarius mucosus</i>	

The composition of the soil is one of the determining factors in the development of any one of the vegetational types—the edaphic factor as it is called. Despite anything that has been written to support the opinion that the geological features of the soil are important factors in the life of the fungi, my own observations suggest that the only discoverable effect of the edaphic factor is that reflected by the higher plants. Some mycologists have been able to group fungi as calcicolous, calcifugous and silicicolous, respectively, and compile fairly lengthy lists of species which fall within those groups. Possibly I require to work over a much larger area than Yorkshire before my observations can be regarded as conclusive evidence on this point, but I think they are worthy of mention. We have in Yorkshire geological features representative of the Chalk, Magnesian Limestone, Coal Measures, Millstone Grit and peat, giving us soils with a range of composition and texture likely to be significant to plant life of any kind, if composition is a factor of any moment; the mapping of the higher vegetation in this county by the late Dr. G. W. Smith and others shows how significant it is, but I have found no corresponding differentiating effect upon the fungi. In the five Watsonian Vice-counties, 61, 62, 63, 64, 65, into which Yorkshire is divided, the distribution of the fungi in the last four of them is fairly uniform and abundant, while in V.C.61, the flora is disproportionately sparse. At one time I held the opinion that discrepancies in the number of species recorded in the North, East and West Ridings might be explained by the more intensive recording by Massee resident in the North and Crossland in the West, and I still think that to some extent the explanation holds good. My own excursions into V.C.61 have given results which suggest that compared with any other part of the county of similar size (except the treeless moorlands of the North-west) there is a definite paucity of fungi in both the number of species and their relative profusion. The geological features of a considerable portion of that area, the Wolds, might furnish an argument in favour of geological explanation of the difference in distribution, because there we have outcropping rocks of the Cretaceous system, and types of soil and drainage not found in other parts of Yorkshire. Alternatively, another interpretation is one which supports my view that the fungi will follow the trees apart from any question of geology other than that operative upon the phanerogamic vegetation.

Within the last year, Miss H. A. Wilcox (Mrs. G. S. Trelearen) has published a valuable memoir *The Woodlands and Marshlands of England*,

accompanied by two maps, illustrating (a) the woods and marshes in prehistoric times compiled from geological, topographical and climatic evidence, and (b) the woods and marshes of historic times as deduced from early literature. An inspection of these maps shows that the extent of woods of the Vice-comital area 61 through the historic period has been comparatively small, while in prehistoric times when the whole of the remaining part of the county, and adjacent portions of Lancashire and Westmorland were densely wooded, the Wolds remained treeless and Holderness was a marsh.

I should like to make one or two observations about fungi in relation to soil reaction. The reaction of the soil in regard to bacterial activity and the development of the higher plants is of paramount importance, but when we begin to look at fungus distribution as conditioned by the reaction of the soil, the relationship is not so obvious; in my experience it has proved illusive and inconclusive. A few years ago I entertained the notion that given a set of reactions in terms of hydrogenion concentration for a district, it might be possible to find the fungi I might wish to see. Conversely, given a fungus, it should be possible to deduce within reasonable limits the pH value of the soil in which it grew, as I believe can be done where some of the higher plants are concerned. That idea was based on laboratory experience. Many fungi are extremely sensitive to reaction. In the case of the Saccharomycetes, for example, it is possible to grow colonies in a series of dishes containing media which differ only in reaction at regular intervals between say pH4 and pH8. The effect of the reaction as indicated by the size and healthy appearance of the colonies at intermediate reactions is so consistent that it is possible to arrange the dishes in consecutive order according to reaction without reference to the labels. Moulds of many kinds are also very sensitive, and the technical mycologist makes use of reaction in his media for the encouragement or elimination of yeasts, moulds or bacteria according to his requirements. So also must the physiologist in the investigation of any kind of living organism, consider reaction a question of prime importance.

The toadstools of the woods, fields and other places exhibit no such sensitiveness to soil reaction. *Coprinus micaceus* flourishes as well in a corner of some ground on the Millstone Grit in Leeds, in soil with a high acidity represented by pH5.1 as it does on the Magnesian Limestone at Micklefield, at pH 6.8-7.0. *Stropharia aeruginosa* is common in the same two localities. *Stropharia albocyanea* grows in fields on the Millstone Grit as well as on the top of the chalk cliffs at Flamborough, and it is equally true of other field species belonging to the genera *Hygrophorus* and *Entoloma*. The bird's nest fungus, *Nidularia vulgare* has been seen growing from a few textile fibres embedded in the ground surrounded by the acid-indicating Dock, and a specimen has been sent to me that was found growing on strawboard with a strongly alkaline reaction represented by pH9-10. In some grounds at Headingley, Leeds, the reaction of the soil varies between pH 3.9 on the surface, due to soot deposits, and pH 5.7 on the cultivated soil, while on the lawn it is pH 5.1, but there are no fungi found there that do not grow equally well in Limestone areas.

In seeking for some explanation of the discrepancy between pure culture work in the laboratory and the occurrence of fungi in nature, it has to be remembered that the medium of the Petri dish on which a fungus is growing has a reaction which is uniform throughout. There can be little doubt that the reaction found to be optimum in the Petri dish will be that at which the fungus will grow best in its natural surroundings. There is, however, this difference between a fungus growing on a laboratory medium and a specimen of the same kind developing naturally. In the dish it is growing as already mentioned, on a medium of uniform composition, whereas in the other case it is growing *in* and

through a soil of non-uniform character, and is probably deriving its nourishment from a substance entirely foreign to the soil itself, and in many instances in a position distant from the place where the sporophore pushes its way out of the soil. I do not wish to minimise the importance of the relationship of reaction to the fungus itself, but to point out that from my own observations the reaction of the soil in which a fungus grows is not necessarily that of the material on which it is growing.

In peat the reaction is more uniform, but fungi which grow on it are associated with surface vegetation. On our Heather moorlands, among mosses and lichens, *Omphalia umbellifera* is a characteristic agaric, but I have not seen it growing on bare peat of which there are great tracts in the Southern Pennines. Coniferous plantations situated on the peat in Upper Teesdale or in the Plain of York support similar fungus florulæ.

On this occasion it is not possible to discuss any other of the factors of habitat. The time at my disposal would be inadequate for dealing with the vegetational types of the Table, and lists of fungi that might be given for them would be wearisome in an address of this kind. In the meantime, I suggest the use of the Table for recording purposes. The species of fungi collected on an excursion recorded as far as possible with the vegetational type in which they occur, and with some indication of their distribution as parasites or saprophites, soil fungi, coprophiles, and other adventive species like the entomophytes, etc., would give a much more interesting and informative picture than do the systematic lists published in *The Naturalist*. At the present time, as you are aware, I am responsible for that form of publication which merely copies precedent of fifty years mycological work in Yorkshire; it was commenced by Geo. Massee followed by Chas. Crossland and has been continued by Mr. A. E. Peck and myself. May I venture to hope that in the future with your co-operation a change may be effected in that direction. Not only would it add interest to the reports in *The Naturalist* but in my opinion it would render better service to botanical science.

OCCURRENCE OF THE WHITE-SIDED DOLPHIN AT WHITBY

F. SNOWDEN

A Correction

IN *The Naturalist* for November, 1929, I recorded the occurrence of a Dolphin which was stranded at Whitby, on 19th June, 1928, and which was considered to be the White-beaked. It was forwarded to the British Museum, and recent investigation has established the fact that it was an example of the White-sided Dolphin (*Lagenorhynchus acutus*).

Mr. W. J. Clarke who has been in correspondence with Mr. Francis C. Fraser the expert in charge of the cetaceans at the British Museum respecting the Yorkshire records, has been informed that Mr. Fraser had re-examined the Whitby specimen and has no doubt as to its identity. Mr. Fraser writes: 'I have re-examined the skull and skeleton of the specimen and find that it is not *L. albirostris* but *L. acutus*. The skull was sawn across and mutilated at the tip, but still sufficient preserved to enable its similarity to *acutus* rather than to *albirostris* to be recognised. The teeth which remain are too small to belong to a White-beaked Dolphin of the reported length of this specimen and the number of vertebræ approximates to that found in *acutus*.'

Mr. Fraser adds that his identification of the specimen has been confirmed by Sir Sydney Harmer, the eminent zoologist.

THE YORKSHIRE NATURALISTS' UNION'S SEVENTY-THIRD ANNUAL REPORT FOR 1934

(Presented at Bradford on Saturday, December 8th, 1934.)

The Seventy-second Annual Meeting was held in the University, Leeds, on Saturday, December 9th, 1933, and the Annual Report was published in *The Naturalist*, January and February, 1934, pp. 13-24, and 35-48.

The Presidential Address, on 'The Animal Biology of Upland Streams,' was delivered by Mr. J. Meikle Brown, B.Sc., F.L.S., F.R.E.S.

The Secretariat.—The Executive accepted with regret the resignation of Mr. F. A. Mason, F.R.M.S., of Leeds, who has held this office since 1921, at first jointly with Dr. W. H. Pearsall, F.L.S., the latter resigning in 1931. The President voiced the feelings of the Executive in appreciative terms of the services rendered to the Union by Mr. Mason during the long period he has held the office and the high standard of efficiency he has attained in his work of organising the excursions and indoor meetings. Mr. Mason's services as Secretary will be greatly missed, but the Executive trust that he will still be present to guide and advise the Union with his deep insight into its requirements. Mr. Chris. A. Cheetham was elected Secretary.

The Presidency has been offered to and accepted by Mr. W. S. Bisat, F.G.S., in recognition of his work in the field and for his valuable contributions to the study of Yorkshire Geology.

Field Meetings have been held in 1934 as follows :—N.E., Farndale, April 14th; N.W., Askrigg for Semerwater, May 19th to 21st; M.W., Fairburn, June 16th; S.E., Flamborough, July 14th; S.W., Goole, August 4th to 6th; Fungus Foray, Ingletcn, September 15th. In addition to these the Botanical Ecological Committee had a field meeting at Austwick, Easter, March 31st to April 2nd. The Vertebrate Section held meetings in Leeds on February 17th and October 20th. The Conchological Section had field meetings at York, June 2nd, and Bentley, September 1st, and the Entomological Section, with the Plant Galls Committee, a field meeting at Ripon on June 23rd.

The Excursions for 1935 will be as follows :—

- S.E. Hornsea, Easter, April 20th-22nd.
- N.E. Hovingham, August 3rd-5th.
- S.W. Langsett, July 6th.
- M.W. Bentham, Whitsuntide, June 8th-10th.
- N.W. Tanfield, May 11th.
- Fungus Foray. Helmsley.

The following changes of address have been notified during the year :—

- Abercrombie, R. G., B.A., M.D., to Derwent House, Hathersedge, Derbyshire.
- Belbin, H. L., to 69 Crawshaw Grove, Beauchief, Sheffield.
- Bradley, A. E., to 1 Pilgrim's Lane, Hampstead, N.W.3.
- Browning, Miss D. M., B.Sc., to Lindens, Victoria Avenue, Yeadon.
- Butterfield, J. A., M.Sc., F.G.S., to 28 Ashfield Drive, Frizinghall.
- Harvie, Miss D. E., B.Sc., to 35 Abercorn Place, London, N.W.8.
- Kaye, Mrs. and Miss E., to Oak Cottage, Keighley.

Morris, T. O., M.Sc., to c/o Oil Dept., Steel Bros & Co., Ltd., 6 Fenchurch Avenue, E.C.3.

Pilkington, Miss E. M., to 58 Dixon Lane, Lower Wortley, Leeds 12.

Smart, Dr. Douglas, F.R.E.S., to 1 Derby Road, Woodford, London, E.18.

Thomas, Rev. H., M.A., to 5 Blenheim Terrace, Oxford Road, Dewsbury.

Wright, J., F.G.S., to Balado, 212 Colinton Road, Edinburgh 11.

Wilson, C. H., to 33 Peasholme Drive, Scarborough.

Membership.—The following new members have been elected during the year, making a total of 301, the loss by death and resignation leave this number as last year :—

Barnes, M. D., 12 Dudley Road, Marsh, Huddersfield.

Bain, W., M.Sc., Enniskerry, Gomersal, Leeds.

Bain, Mrs. W., Enniskerry, Gomersal, Leeds.

Bunce, H. O., 37 Auckland Avenue, Cottingham Road, Hull.

Rob, Miss C. M., Catton Hall, Thirsk.

Smith, L., 72 Cranbrook Avenue, Cottingham Road, Hull.

Spaul, Prof. E. A., D.Sc., F.Z.S., Zoology Dept., Leeds University.

Smith, S., B.Sc., The University, Leeds.

Watson, R., Thornthorpe, Ben Rhydding.

Wood, J., 138 Redcliffe Street, Keighley.

Wrangham, G. W., 12 Piccadilly, Bradford.

Wright, R., B.Sc., Whitwood Senior School, Castleford.

Yeoman, Miss K. P., The Close, Brompton, Northallerton.

Affiliated Societies.—The number of Societies now affiliated to the Union is thirty-seven, with an aggregate membership of 3,051, bringing the total strength of the Union up to 3,352.

Obituary.—This year we have lost some old and valuable members by the deaths of E. B. Lotherington, J. R. Simpson, E. Snelgrove, C. F. Tetley, M. L. Thompson, T. J. Foggitt, J. E. Wilson and H. J. Wilkinson.

Delegate to the British Association and also to the **Wild Plant Conservation Board of the Council for the Preservation of Rural England**, Mr. Thos. Sheppard, M.Sc.

Conference of Delegates.—(Mr. T. Sheppard) : Your representative had the pleasure of taking the Chair on the two occasions when the Conference of Delegates was held at the British Association Meeting at Aberdeen. The President, Sir Henry G. Lyons, gave an address as referred to in *The Naturalist* for October, page 231. Professor P. G. H. Boswell read a paper on 'Town and Country Planning Schemes in relation to Sites of Scientific Importance'; Sir Albert E. Kitson read a paper on 'The Necessity of Recording Well-sinkings and Borings for Water'; Professor F. G. Baily and Mr. P. Thomsen spoke on 'National Parks for Scotland'; and Mr. A. Farquharson gave a paper on 'Population Maps, their Preparation and Significance,' which was illustrated by a large series of diagrams. Summaries of these papers will be found in the *Journal of the British Association* for the Aberdeen Meeting, pages 128-130.

A recommendation from Section E (Geography) urging the revision of the Ordnance Survey Maps of the British Isles received the support of the Conference.

At a meeting of the Corresponding Societies Committee subsequently held in London, it was recommended that Mr. Thomsen's paper on 'National Parks for Scotland' be reprinted *in extenso* in the next Report of the Association.

The Naturalist.—Our Editors, Dr. W. H. Pearsall and Mr. W. R. Grist, have maintained the high standard they set up last year, and valuable reports of the work done by our various Sections on the Union's excursions are to be found in its pages together with accounts of the other activities of our Society. The Editors have repeatedly drawn attention to the meagre number of field notes received from individual members, and we would urge all members to realize that the full value of the journal can only be attained through the help and co-operation of each member.

BIOLOGY SECTION

Freshwater Biology (Charles Allen). Although a few heavy rains resulted in some local flooding at the beginning of the season, the year 1934 has been a dry one, and following on the dry year of 1933 has resulted in the drying up of many watery habitats, and the level of permanent waters has been low throughout the greater part of the period.

As an illustration of this low water level the following Lock sill readings from the automatic recorder in the Linton Power Station may be of interest.

The Power House is situated at Linton Locks on the River Ouse which at this point carries the waters received from the Swale and Ure watersheds. The next locks are at Naburn, so that the Lock sill readings taken below the weir at Linton will give some indication of the general water level of the non-tidal part of the Ouse basin. The so-called 'Summer Level' is reached when there is 5 ft. 9 in. of water on the sill. The following readings were taken at 9 a.m. on each day :—

Date, 1934.		Depth of water on sill below the weir.					
		ft. in.					
August	13th	...	...	...	...	6	8
	14th	...	...	...	...	6	7
	15th	...	...	...	...	6	5
	16th	...	...	...	...	6	1
	17th	...	...	...	...	6	0
	18th	...	...	...	...	5	11

An interesting fact in connection with the flatness of the York Plain is that this sill is only 11 ft. 6 in. above sea-level.

During the period given above, that is from 13th August to 18th August, 1934, a survey of the Rivers Ouse and Ure from York to Ripon was carried out by the Convener, and the general results may be summarised under three headings.

I—RIPON CANAL.

At the time of the visit the waters were so low that the locks above Littlethorpe could not be worked, the part of the canal examined consisted of the lower two miles, here the canal is between 40 and 50 ft. wide and in depth 5 to 6 ft. The water was clear and unpolluted, with very little current. The bottom was composed of thick mud in which *Potamogeton natans*, *Elodea canadensis*, *Hippuris vulgaris*, *Apium nodiflorum*, *Sagittaria sagittifolia*, *Polygonum amphibium*, *Callitriche*, and *Chara* were growing plentifully. Under such conditions the smaller animal life was abundant. The dominant mollusc was *Limnaea peregra* of small size, but *Physa fontinalis*, *Planorbis umbilicatus*, *P. carinatus*, *P. albus*, *Bithynia leachi*, *B. tentaculata*, *Valvata piscinalis*, *Anodonta cygnaea*, and *Sphaerium corneum* were all plentiful. Insect life was also abundant. Hemiptera were represented by *Gerris* on the surface and *Sigara* in large quantities among the plants. The beetles *Deronectes elegans*, *Platambus maculatus*, and *Haliphus* spp. occurred frequently, and a *Gyrinus* probably *substriatus* was also much in evidence. *Sialis lutaria* and the Mayfly larva *Batis*, with various *Chironomids* were the commonest forms of fly larvæ, whilst

the crustaceans *Asellus aquaticus* and *Gammarus pulex* occurred in fair numbers. Fish were abundant, mainly Pike, Roach, Perch, Eel, and Gudgeon, whilst Minnows, *Leuciscus phoxinus*, were in swarms.

II—FROM OXCLOSE LOCK TO NIDD MOUTH.

This is the main stream of the Ure and Ouse, deep and wide and subjected to periodical heavy flooding. As one descends it from Oxclose Lock the amount of aquatic vegetation gradually decreases. As far down as Milby Lock the banks have a fair quantity of marginal sub-aquatics, whilst patches of *Potamogeton natans*, *P. perfoliatus*, and *P. pectinatus* frequently mixed with *Myriophyllum spicatum* occur in the quieter parts of the stream. After Milby Lock is passed the banks have less plants and the patches of weed in the stream become less frequent, in both cases gradually decreasing until by the time Nidd mouth is reached the river has become a wide deep body of water moving between banks scoured free from any appreciable amount of marginal plants and devoid of the patches of true aquatics with the exception of algal growths and *Fontinalis antipyretica* in suitable localities.

Several spots in the sides of the river where the marginal plants grew, and also the patches of *Potamogeton* were investigated. They were found invariably to be giving cover to large quantities of fish fry, mainly of the *Leucisci* genera, from half an inch to one and a half inches in length. In these patches of plants the fish find not only protection from the force of the current, but also abundant supplies of food. The molluscs *Sphaerium corneum* (immature), *Limnæa peregra*, *Planorbis albus*, *Bithynia tentaculata*, *Paludetrina jenkinsi* v. *carinata* were all present, spawn of these snails was plentiful and young snails abundant; in addition the larval forms of Mayflies, *Batis*, *Ecdyonurus*, and *Heptagenia*, many surface-living Chironomids, and the Hemiptera *Sigara* formed a further food supply. The beetles taken were *Platambus maculatus* and *Haliplus* spp. plentifully, with some *Deronectes elegans* and one example of *Latelmis volkmari*. The presence of these 'Nurseries' undoubtedly has a beneficial effect on the supply of the so-called 'leather-mouthed' fishes, which in turn form the food of the purely carnivorous groups.

III—FROM NIDD MOUTH TO YORK.

This stretch of the River Ouse is wider and deeper, flowing through flat land with low banks scoured periodically by floods. Both marginal vegetation and masses of aquatic plants in the stream are absent. The animal life is confined to those forms which live in or on the muddy bottom, among the mollusca taken were *Anodonta cygnæa*, *Unio pictorum*, *Sphaerium corneum*, *Vivipara vivipara*, *Neritina fluviatilis*, *Bithynia tentaculata*, *Pisidium amnicum*. Among the insect larva, *Ephemera*, Chironomids, and *Sialis lutaria* predominate. The location of the main food supply may perhaps be a contributory factor in causing the bottom feeding fish, Gudgeon and Pope, to be so common, in this part of the river certainly these two fish are exceedingly plentiful and seem to largely replace the members of the *Leucisci* family which are more abundant in the higher reaches.

During 1934 Mr. Sydney H. Smith, of York, has devoted special attention to the spawning methods of Roach, *Leuciscus rutilus*, with a view to finding out if these fish could be raised by 'stripping' and hatching the ova. In this work he has had the advantage of the special opportunities provided by the Yorkshire Fishery Board at their rearing and experimental station at Keld Head near Pickering. With the assistance of Mr. J. Paton, the Board's fish hatchery attendant, twelve large Roach from $\frac{3}{4}$ to $1\frac{1}{4}$ lbs. weight were selected in January, 1934, and placed in a small pond 15 ft. by 6 ft. by 3 ft. deep, fed with running water from the Trout ponds overflow. Part of the pool was shaded and a supply of the normal water plants of the area, *Apium nodiflorum*,

Hippuris vulgaris, *Chara*, *Callitriche*, *Ranunculus* were introduced. These stock fish were well advanced towards spawning at the end of June, and it was intended to strip them and hatch the ova. This scheme came to an abrupt end early in July when an otter paid a nocturnal visit to the pond and cleared out and destroyed every one of the fish. An adjoining pond held a stock of 150 Roach which it was expected would have spawned in 1933; however, nothing was observed, and it was thought that the low temperature of the water, 47 degrees (Fahrenheit), had prevented ova maturing in these stock fish. In the light of later knowledge it is evident that the Roach did spawn, the resulting fry being lost by passing out of the pond into the River Costa.

At the beginning of 1934 Mr. Paton placed a new type of trap overflow in the pond. Spawn was produced by this shoal late in July, the ova being very small, shed free, and fertilised by the male fish in the shoal apparently in a similar manner to that of herrings. Hatching was complete in from sixteen to twenty days. On October 11th about seventy Roach fry, five-eighths of an inch long, were removed from the pond and are under observation in a specially prepared pond, and another batch was placed in a glass tank, where their further growth can be noted, a supply of the fry being left in the pond for purposes of comparison.

It is evident that Roach in Yorkshire spawn much later than has, up to the present, been taken as the normal period, and it is quite possible that the water temperatures, light and shade, play a very important part in that process.

It is intended to carry on with the effort to cultivate Roach during 1935, and a series of small ponds have been prepared and protected against vermin. The stock fish will be under daily supervision and the water temperatures carefully checked so that much more complete information will be available.

Mr. A. Malins-Smith reports that the year 1934 has been a poor one for the collector of algæ, and this has undoubtedly been due to the low rainfall in the early part of the summer. Algæ of shallow pools and casual water which usually provide a large proportion of the collector's finds have been practically absent, and collections have had to be confined to more permanent waters. There is nothing striking in the few records made.

A feature of the Red Beck, Heaton Woods, in the dry weeks of June and July was the special abundance of *Cladophora*. Mr. Malins-Smith is inclined to attribute this to the much smaller dilution of certain effluents of farmyard drainage than usually takes place, so that the waters would probably be richer in nitrates, his own and other research points to the likelihood that this is a main controlling factor in algal abundance. It may be another aspect of this fact which accounts for the abundance of algæ at Austwick in August, for a visit there coincided with the beginning of a wet period following a long drought. In these conditions stream waters would, no doubt, be richer in nitrates.

I am indebted to Messrs. Sydney H. Smith, A. Malins-Smith, J. R. Dibb, and W. D. Hincks for assistance in compiling this report.

VERTEBRATE ZOOLOGY SECTION

West Riding (H. B. Booth) : ORNITHOLOGICAL REPORT.—A feature of the mild winter of 1933-34 was the number of northern Ducks reported—especially Goosanders. Mr. A. Gilpin reported parties of from five to twenty birds from the 17th December to the end of February (usually about one-third were adult males) on Eccup reservoir, near Leeds. At the same place and time Goldeneyes were usually present, generally from three to five birds, but on April 14th there were nine birds present. I visited Eccup on March 17th, and besides others that were flying about, I saw a flotilla of nineteen Goosanders, eight of which were adult males. Mr. W. F. Fearnley saw several on the lake in Harewood Park on

February 25th. I saw three at the same place on March 3rd, and much rarer, four Smews, one adult male, one immature male, and two females. (Two reports of single Smews on neighbouring waters shortly afterwards may possibly have been from the same party.) I have never seen any piece of water so packed with bird life as Harewood Park on March 3rd. There were many hundreds of Coots, nearly as many Mallards, scores of Tufted Ducks and Pochards, numbers of Wigeon, and one Great Crested Grebe, besides the semi-domesticated Whoopers, Mute Swans, and Canada Geese.

HERONS.—In spite of the statement made by a certain Fishery Board that the number of Herons has 'increased enormously,' there has actually been a decrease of at the least four nests in the West Riding this year. The apparently occupied nests in the various heronries were Gargrave 21, Gisburn or Bolton-in-Bolland 6 or 7, Hubberholme 6 or 7, Harewood Park 7, and Grass Woods (R.B.) 1 or 2. The pair that have frequented Westy Bank, Bolton Abbey, and nested, or endeavoured to nest, for several years, did not put in an appearance this year (Rev. C.F.T.).

GREAT CRESTED GREBES.—The pair has not returned to Malham Tarn again, although some of the Mute Swans have left. They have again nested on Eshton Tarn and on Coniston Cold Lake. Two pairs have frequented Chelker reservoir all the season. They have built several nests and laid eggs; but all with no result. It surprises me that the Great Crested Grebe does not learn by experience to avoid nesting on reservoirs with fluctuating water levels, where they only occasionally manage to rear any young. It would almost appear as though the plentiful food supply of fish was too tempting for them to leave, in spite of their duty to posterity.

ROOKS, ETC.—Mr. Sam Clough reports 297 nests in the Steeton rookeries, or four nests more than last year. In the Ilkley district, after the catastrophe of last year (see *The Naturalist*, 1934, pp. 16-17), fifteen nests were built in trees near to the old bridge. These were the only nests within a radius of $1\frac{1}{2}$ miles, and where twenty years ago, or less, there were hundreds of Rooks' nests. As a proof of how numerous Carrion Crows have been around Malham Tarn, on May 27th I actually counted 148 of their bodies and skulls on the keepers' gibbet there, that had only been in use for about two years! There were also the heads of many Lesser Black-backed and Herring Gulls, large numbers of Stoats, Weasels, and Rats, a few Sparrow Hawks, and what I was most sorry to see, nearly a dozen Ravens.

The Shoveler nested at Coniston Cold after missing for a few years. I am sure this species nests in Harewood Park; for although I have not seen nests or ducklings, the birds are there throughout the breeding season. From reports that I have received I believe that there have been rather more Barn Owls' nests than for several years. Game birds have had a good season, particularly Red Grouse. The Woodcock continues to increase as a nesting species, especially in Upper Wharfedale. With the smaller birds I fear that there has been great mortality amongst the nestlings these last two summers, chiefly through drought.

Both the Green—and the Greater Spotted—Woodpeckers are increasing. The Little Owl makes but little progress in this Riding generally, although Mr. Bramley reports it as increasing very considerably in the neighbourhood of Bolton Percy. Many of the summer migrants have been arriving in lesser numbers continually over a period of several years, such as the Blackcap, Redstart, Ring Ouzel, Wheatear, and even the common Spotted Flycatcher, whilst the Corncrake is still rare or absent from places where it was formerly common. The Corn Bunting still persists in Warley Fields, near Halifax, though no corn is now grown there (H. Waterworth). Late in February a Stockdove was sitting on two eggs near Bradford (H. Williams).

A Water Rail was reported at the lake in Denton Park, Ben Rhydding, on December 10th (W.F.F.), and at the same place I saw a pair of Pintail on December 31st.

An immature Whooper was seen by several observers in February on the River Wharfe, near Pool. It would doubtless be an escape from Harewood Park, where in some seasons the cygnets have not been pinioned.

On the morning of March 10th I was surprised to see a Glaucous Gull in about its third year's plumage on the river at Ben Rhydding. It was vigorously bathing itself on a submerged stone, and allowed an approach to within about 60 yards with a good pair of binoculars, and the near by presence of several Black-headed Gulls made the comparison in size an easy matter. When its ablution was completed it rose and followed the course of the river downwards until it was lost to sight, as if it were making for the East Coast.

On December 31st Mr. W. F. Fearnley saw a large flock of over one hundred Bramblings in Bolton Woods, near to Laund House. They were turning the fallen leaves over so rapidly, so as to suggest that a violent wind was blowing. Mr. A. Gilpin reported a flock of about fifty Bramblings near Adel on February 4th.

On May 5th a female Common Scoter was seen on Eshton Tarn in company with several Tufted Ducks.

Although the Ring Ouzel was rather late in arriving this season (my first report was April 8th), Mr. R. Butterfield saw a stray bird for some time on March 2nd in his garden *in the valley* at Keighley. Mr. Butterfield sends me an old record of a pair of Montagu's Harriers nesting on Cam Fell, near Gearstones, Ribbleshead, in 1919. The gamekeeper (T. Wildman) trapped the male on June 4th and took the three fresh eggs. Mr. Butterfield has seen the stuffed male and the eggs. Several gamekeepers on the moors around the upper reaches of the Aire and Wharfe report that for some unknown reason no Merlins have returned to their usual nesting sites this year. On the moors lower down these valleys they appear to have returned as usual.

(To be continued.)

BOOK REVIEW

The Myth of the Mystic East, by Lieut.-Colonel Robert Henry Elliot, M.D., Sc.D., F.R.C.S., pp. xii+301. (Blackwood, price 7/6). During the last year or two there has been a revival of interest in the Indian 'Rope Trick' and other examples of Indian conjuring. A good deal of correspondence has appeared in certain daily papers and other periodicals and now comes Colonel Elliot's book to clear up the whole business once and for all. Indian conjuring is usually performed under circumstances making for inaccurate and biased descriptions. The whole atmosphere is 'mysterious' to the average westerner, but Colonel Elliot is a scientific medical man with a long experience in the East and he has had unrivalled opportunities of getting behind the scenes. His conclusions are worth studying. The Indian conjuror is a 'one-trick' man. He has done nothing else all his life and he is an expert performer. Small wonder then that he manages to mystify his average audience, 'but when spoken to as a man and a brother he would laugh as heartily over the methods and success of his deception as would any confrere of the magic circle in London to-day.' There is a chapter on witch-craft, and nearly half the book is devoted to poisonous snakes, effects of snake-bites and their treatment. It is difficult to convey in a short review what an entertaining and informative book this is. It can be thoroughly recommended to all naturalists, and to those who are at all interested in Eastern magic.

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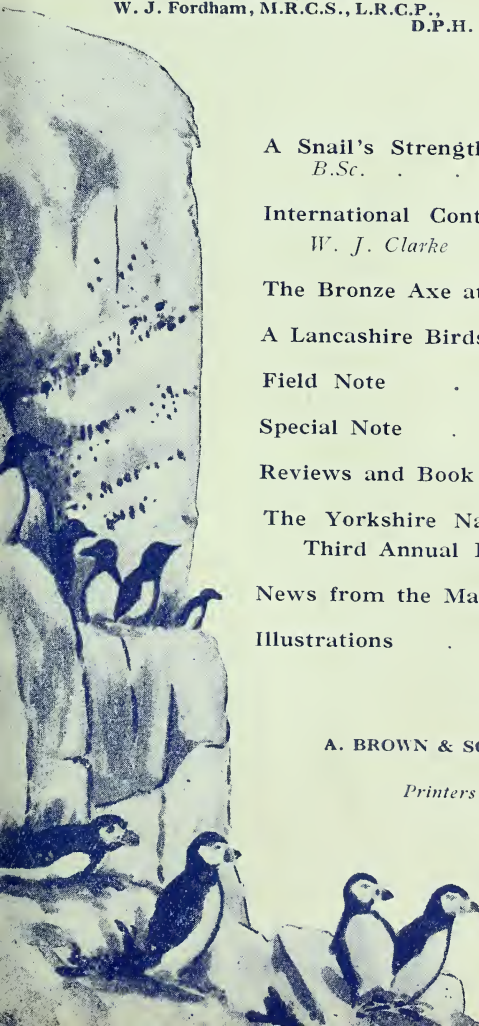
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VERTEBRATE SECTION.

President of the Section : ALBERT HIRST, J.P.

TWO MEETINGS will be held in the Library of the Church Institute, Albion Street, Leeds, on Saturday, February 16th, 1935, at 3-15 p.m. and 6-30 p.m.

The following papers will be read :—

‘ Birds of the Estuary,’ by C. F. Procter.

‘ The Hen Harrier ’ (illustrated), by R. Chislett, F.R.P.S., M.B.O.U.

‘ Birds of the North ’ (cinematograph film), by V. S. Crapnell.

Members and Associates are cordially invited to attend and to bring notes, specimens and lantern slides. Will Officers of Affiliated Societies kindly notify their members?

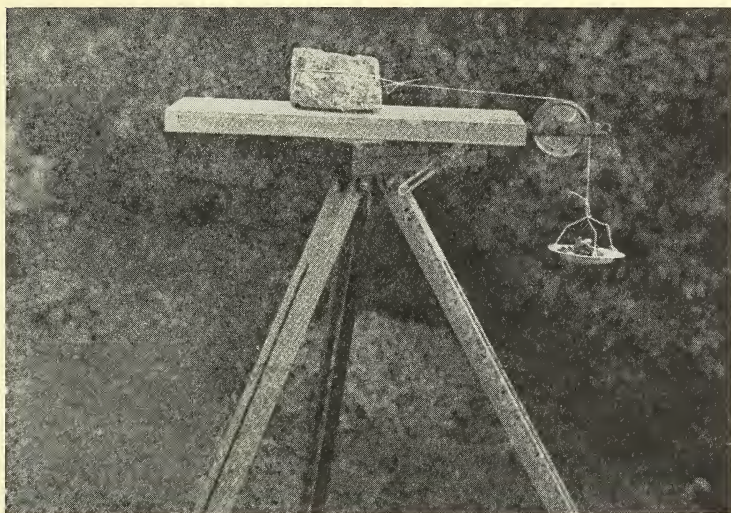
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13 Chestnut Avenue, York.

A SNAIL'S STRENGTH

GEO. B. WALSH, B.Sc.

IF we pull at a horizontal rope passing over a pulley, the greatest weight we can support at the other end of the rope depends on two, and only two, factors : (a) our own weight (mass), and (b) a certain fraction, called the co-efficient of friction, which depends on the friction between our footwear and the surface on which we are standing. This fraction is very frequently approximately 0.5. In Fig. 1 we see an apparatus fitted to illustrate this. The piece of brick weighed

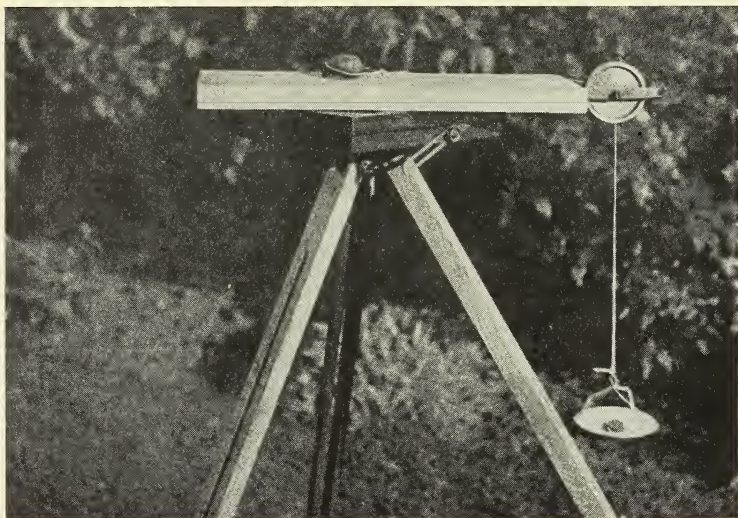


5 lbs., and rested with its smooth surface on a piece of smooth wood. A piece of string passed from it over the smooth-running pulley, and carried at its other end a scale-pan into which weights could be put. It took a weight of $3\frac{1}{2}$ lbs. to keep the brick just moving when a slight initial push was given to start it. Thus the co-efficient of friction between the brick and the wood was the ratio $3\frac{1}{2}$ lbs. : 5 lbs., *i.e.* 0.7. In other words, if the co-efficient of friction between a man's soles and the ground were the same quantity, and if he weighed 12 stones, he would be able to support in the scale-pan a weight of 0.7×12 stones, *i.e.* 8.4 stones.

The experiment was repeated, as shown in Fig. 2, with a normal specimen of the Garden Snail (*Helix aspersa*) which weighed 12 grams. The scale-pan weighed 4 grams, and, after the snail had been allowed to get a good grip, weights totalling 145 grams had to be put into the scale-pan before

the snail showed any signs of being inconvenienced. Then, and not until then, it was noticed that the cord had slipped off the pulley and was resting partly on the axle and partly on the edge of the wooden plane, and thus the reading was invalidated. However, the snail gave one mighty heave, as though to show its Samson's strength, and lifted this relatively tremendous weight for about half an inch, and then slipped gently back.

It was rather late evening and so the snail was put back into its cage with a tender cabbage-leaf and left for the night. In the morning the test was repeated with the string in its



correct position, and this time the snail supported a total weight of 79 grams, *i.e.* more than six times its own weight.

Next the snail was put on a piece of squared graph paper and a light pencil mark was put round the edge of the mantle as it rested in a similar position to the one it had when it was pulling. The area worked out at 6.01 sq. cm., so that on every square centimetre the snail was exerting a pull of approximately its own weight.

It is obvious that these results cannot be explained on mere friction alone. Much must obviously be due to air pressure rendered available by the dampness of the snail's body and its close adhesion to the surface. As the total air pressure on the 6 sq. cm. was about 6,200 grams, only a slight proportion of this had been utilised, owing largely, doubtless, to the fact that the pressure was vertical whereas the pull was horizontal.

INTERNATIONAL CONTROL OF SEA FISHERIES

(The Report of Delegates of the United Kingdom of the twenty-seventh meeting of the International Council for the Exploration of the Sea, June, 4th to 11th, 1934.)

THE Report of the United Kingdom delegates, H. G. Maurice and Professor D'Arcy W. Thompson, shows that the International Council has agreed unanimously (Art. 2) that the most useful measure of control will take the form of prevention of the capture of young fish. To ensure this the Council recommends (Art. 3, 4, and 12) the use of the minimum mesh sizes for nets already enforced by the regulations of the British Government and also (Art. 6 and 7) the imposition of size limits for landed fish, in order to discourage fishing on areas where small fish predominate. It is further advocated (Art. 10) that the use of small mesh nets for prawns and shrimps should be regulated at certain times and in certain places, the regulations to be framed by each country in the light of local experience and in order to prevent the destruction of immature fish.

These recommendations represent the views urged by the British delegates on behalf of their Government, and it must be a matter for congratulation that definite progress in size limitation is in sight.

With recommendation No. 2, and the latter part of No. 12 where it emphasizes the fact that the chief thing to aim at is the *prevention* of the capture of undersized fish I am cordially in agreement. But this result will not be attained by the decisions of the Council as set forth in this report.

Recommendation No. 3 regarding the size of the mesh to be used in the trawl net is on the right lines, but stops short of what is necessary. It is not so much the size of the mesh as its shape, which is most important. In a modern otter trawl net the mesh sizes are : Top, square, 5 in. ; 2nd, wings, $4\frac{1}{2}$ in. ; 3rd, belly, 2 in. ; 4th, cod end, $1\frac{1}{2}$ in. The strain on all these meshes, excepting the wings, comes from knot to knot so that in practice the mesh closes up into a bag from which there is no escape, and small fish, shrimps, sand, etc., cannot get through it. To obviate this the strain should be altered so that the mesh remains open and allows space for small fish to escape, for it is little use having a big mesh if it is tightly closed so that nothing can get through it. If this was done the present mesh would be large enough to allow the small fish to escape. Fishermen to whom I have talked on this subject tell me that such a net cannot be made, but some forty or fifty years ago a Scarborough net-maker, the late Mr. Wm. Jones, made one which would work with

an open mesh ; a model of it was exhibited in London, and was awarded a medal, but it never came into practical use. The square mesh is the solution of the difficulty so far as trawling is concerned.

Regarding the recommendations advising the imposition of a size limit on the fish landed, this would be quite useless so far as the trawl is concerned, as at the end of a "tow" all this small stuff is crushed and smothered beneath the weight of larger fish, and debris, and is dead when brought on board the vessel ; if, therefore, there is a market for it, it may just as well be brought ashore as cast away after life is extinct. And a market for this small fish does exist amongst the poorer classes who patronize the "fried fish" shops.

Recommendation No. 10 raises a very important question. The constant trawling of the shallow water close inshore (the nursery of the sea) by cobbles with small meshed beam trawls is responsible for the destruction of an enormous amount of immature fish and small crabs, and it should most certainly be prohibited at the earliest possible moment.

A very important point which the report does not touch is the way in which, in the early spring, the trawlers and other fishing boats concentrate on the spawning grounds of the cod for the express purpose of catching the breeding fish. From January to the end of April our fish market is packed with large breeding cod, whose flesh is in its very worst condition for food, but which are caught for the roes for which a keen demand has grown up in recent years. These spawning beds are quite well-known and should be declared prohibited areas during the breeding season. No better way of exterminating the cod could be devised than the present practice, and this aspect of fishery protection certainly calls for immediate action.—W. J. CLARKE.

BRONZE AXE AT BRADFORD

WE have recently obtained for the museum at Bradford a flanged bronze axe which has lain forgotten in the cellar of the finder for three years. It was found embedded in about 3 ft. of clay by a workman during draining operations on the Ashbourne Gardens Estate, Bolton Road, Bradford.

The axe weighs $11\frac{3}{4}$ ozs., measures $4\frac{8}{10}$ ins. in length, has a cutting edge $2\frac{1}{4}$ ins. wide, shank $1\frac{1}{8}$ ins. wide, flange (side view) $1\frac{1}{10}$ ins. It has a pitted surface and a mottled green patina. The flanges are not straight, but slightly inturned at the bottom, and the thin butt of the shank shows a recent bruise.—M. LONGBOTTOM.

A LANCASHIRE BIRDS' HAVEN WILD BIRDS IN KNOWSLEY PARK

ERIC HARDY, F.Z.S.

THERE is a story that one of the Earls of Derby was offered and refused the crown of Greece, and in describing it, a famous Victorian statesman declared that the Earl preferred the 'beautiful countryside of Knowsley to the Parthenon in Greece.' Whether the story is true is beyond the point, but one could not blame anybody for preferring the beauties of the ancestral park at Knowsley, fourteen miles around its walls, to any other part of the world. Knowsley Park has been a deer park since the days of King Edward the Third, and having benefited from one Earl's love for trees, another's love for wild life, a third's love for deer, and an ancestor's choice of a particularly artistic mansion, it is now one of the most pleasing pieces of countryside in the County Palatine.

Here in the dreamy depths of elms, and pines, and chest-nuts, amid the graceful sequin-leaves of the lady of the woods, the silver birch, the beauty of the kingfisher-haunted lake and where the ladies' smocks thread with lilac paths of gold laid by the celandines in herald of spring, lie unspoilt corners which the lapse of centuries seems scarcely to have disturbed; and in the balmy days of spring, the sun sets the flowers agape and send warm wafts of eglantine and lilac floating down from the gardens across the meadows, and the aroma of hawthorn and the happy twittering of the swallows—never so full of energy that a little ripple of sweet notes does not come to you as the blue wings flash by—are everywhere. The beauty of this stretch of Lancashire countryside never fails to prove the lure of wild life to the park, and nature lovers and ramblers are ever grateful to the privileges afforded them to visit Knowsley and enjoy these things.

For many years I have studied the wild life at Knowsley, particularly the bird life, and there is no day of the year that one cannot find a wealth of wild things in this great ancestral home of the Earls of Derby, even though Liverpool has now crept up to its very walls and with growing fingers arouses fears of encircling all these hundreds of beautiful acres. There are over two hundred species of wild birds in Knowsley Park, and though so close to cities, quite fifty are of unusual interest. Of the rare birds, Lord Stanley, later as the thirteenth Earl of Derby to found the London Zoological Society and become its first president, shot four hoopoes in 1815, what was at first reported to be a great black woodpecker in the park, but later criticised for a misprint for a greater spotted woodpecker, and a female honey buzzard in 1818.

In the winter of 1881, an osprey, on autumn passage, visited the lake in the park and spent some days fishing, when the then Earl saw that no harm befell the rare visitor. The hobby, one of our rare summer hawks, too, has been shot in the woods, and in the August of 1931 the head keeper came across an exhausted specimen of the stone curlew in the park, the first reliable record for Lancashire. Efforts were made to revive this latter bird in Liverpool later on, and it was fed on chopped egg and other nourishments, but all efforts failed and the bird succumbed. It then proved to be a female bird with the left shoulder bone broken, and had no doubt collided with wires or something in its swift flight and had been brought down in the park in the night.

Each year I watch the white wagtail on migration through the park, the spring migration north occurring in early June and the return movement about September, while, in addition to the common wheatears that pass through early in April, sometimes heralding spring as early as March, there is the larger form, the Greenland wheatear, which I sometimes see on my visits. This bird migrates through our land later than the common wheatear and on Merseyside usually occurs about the second week of May. The common wagtails, pied, grey and yellow, all occur in the park, and the pied or water wagtails are very abundant in the autumn and winter. Whitethroats and chiffchaffs nest in many parts of the park, though these summer warblers are never so abundant in our northern shires as in the south. The trees of Knowsley do not ring so much with the two-fold calls of the chiffchaff as, say, some of the large parks of Leicestershire, where, at Hill Crest, where the De Traffords overlooked Market Harborough, I have counted eight chiffchaffs all busily searching one spray, and singing in dozens at the same time, and the noise of their calling has been so intense in the spring rush north that conversation was difficult below; but I think the calls seem sweeter at Knowsley when one can distinguish the individual singers among the odd pairs in the park. I usually hear at least one blackcap singing in the park in summer, though seldom on the Liverpool side, and in the delicious exuberance that is poured forth in a torrent of music I find no regret that we have no nightingales here. Garden warblers, too, nest and sing in summer, but, of course, they are not so sweet as the blackcaps.

The cuckoos plague the pipits, but I have never seen a young cuckoo in the park after summer, and judge that they all move off after they can fly. There are hawfinches and long-eared owls, nightjars and spotted woodpeckers amongst the trees, but I think the last two birds are much less numerous than before-the-war days, and this applies to their kind all

over the north-west. I noted a green woodpecker in the autumn of 1934, while short-eared owls still come in winter. I have not seen or heard a jay in the park for many years, though one eluded the keepers in 1933, but a magpie may be seen or heard chattering at odd times, and often in winter a screaming kestrel hovers overhead as one walks along the roads, till, joined by its answering mate, the two falcons sweep on. In the winter odd merlins can usually be found about Merseyside, and I once watched a couple of infuriated tomtits chasing a merlin across two meadows in the park and passing direct in front of me, so intent were they on hurrying their foe on his way, and I watched them chasing him in the distance until my field glasses could no longer distinguish their forms. A buzzard visited the Huyton side of the park (after wood pigeons) early in 1934. I have heard carrion crows in winter, but they are not nearly so common in S.W. Lancashire as in the Wirral Peninsula of Cheshire. There is a rookery of some thirty nests at the Eccleston side of the park.

The blackbirds of Knowsley never fail to produce the usual piebald specimens, though I have never seen a perfect albino in the park, and all pied blackbirds I have watched have been cock birds. There are usually three or four such freaks each year, and one particular cock bird with pure white head and shoulders was very tame and always approached me at one part of the road. I have often watched pied blackbirds at close quarters, but I have never yet heard one sing, though I have listened to white head robins and hedge sparrows singing. The birds I watched change the intensity of their whiteness at each seasonal moult, some returning completely to normal and others turning grey until another moult sent them white.

The lake at Knowsley Park is, I believe, the park's greatest lure for wild birds, particularly during the migrating season, for there is no other large sheet of freshwater in south-west Lancashire, and the nearest are Martin's Mere, near Southport, which is largely dried up in summer, Wigan Flashes, Carr Mill Dam, and the little Rabymere in the Wirral Peninsula of Cheshire. One has watched one's last swallows over the Knowsley lake on November 4th, and one's first sand martins passing north in the last week of March, and in the spring of 1934 I saw the rare garganey duck, a summer visitor to Britain. In summer two pairs of great crested grebes, among the largest and most handsome of our inland diving birds, have nested on the lake since time immemorial, and, until quite recently, Knowsley Park was the only nesting place of these birds in Lancashire. Kingfishers nest by the water every year, and by keeping perfectly still and quiet I have had

these gorgeous birds perch on the stones bordering the grass banks a few feet in front of me. The other day I was standing thus behind a chestnut tree, with pike-fishers within hailing distance on either side of me. My favourite cock kingfisher seemed particularly eccentric this day, for instead of sitting placently on his usual post in the rhododendrons, he would dart suddenly across the water and perch on the edge of the bank not six feet from me, his brilliant back burning like a thousand sapphires shimmering in the sunshine, and his orange breast's breadth all aglow against the rippling waters. He eyed me up and down with his beady eye, jerking his head swiftly this way and then that, all the while keeping up an incessant flicking of his tail, like a cock robin on the garden gate, then without a moment's notice he would shoot up the bank and suddenly dart straight up into the air, his belly like a flash of fire in the sun and his little rapier-like beak glistening above it, till in the midst of the cloud of dancing gnats I watched, through my field glasses, his beak open and shut ; then down he would come again, and return to his perch on the bank before me, eyeing me up and down as if to ask what I thought of it all. This he repeated over and over again, and then suddenly he shot away upwind like an April thrush and did not return. He does not fish in the same haunts where he roosts, and whenever I am at a certain part of the bank an hour before dark I fix my eyes upon one part of the water, and as punctually as the distant stable chimes he shoots by on whirring wings, travelling from his island fishing quarters to his bedroom in the plantation. Wild grey geese occasionally visit the lake in winter, but their stays are brief. I saw three on November 24th, 1934.

Harriers are amongst the very rare wild visitors to the park, usually in the late summer or earlier autumn, and probably immature birds from Norfolk Broads or Lakeland and Scottish nesting places. It is many years since I have record of the hen harrier in the park, but there have been fleeting visits of the marsh harrier in recent years, and these harriers regularly visited the near-by flooded Sefton Meadows, where they are recognised by their long legs, wings and tails, and their habit of quartering the water or reeds, chiefly for waterhens. The black tern is a very rare visitor to the lake on autumn passage, when the bird is more white than black, for unlike most of our familiar terns or sea swallows, this species is a bird of our inland waters and feeds on insects in a manner very similar to the swallows, whereas the coastal terns feed largely on fish and sand eels. About half a dozen pairs of dabchicks or little grebes nest on the lake, and a plentitude of coots, whose numbers are greatly increased in the winter months, when large flocks of such arctic duck

as wigeon, tufted, pochard and shoveller may be watched. Golden-eye and pintail are occasional visitors, but teal are not quite so abundant as on a near-by sewage farm and the coastal slacks, for they seem to prefer more brackish water. I have seen the smew here in winter. One of the features of English bird life in the last few years has been the increase of nesting duck on the meres all over the country, and at Knowsley, like all the meres of Cheshire and the waters of other counties, winter duck have stayed behind in increasing numbers in the spring. A few pairs of tufted duck now nest and possibly one pair of pochard, while last spring a pair of shoveller stayed much later than the others, but finally left, probably to nest at a haunt near Southport.

Hérons often come to the lake, while the large flock of Canada geese frequently changes abodes with the geese on the Liverpool parks, and there are regular flight lines of these geese over Liverpool from Knowsley Park to Sefton Park and Botanic Park in the city. A generation ago a flock of fifty shoveller would be an exceptionally rare sight, but such flocks are not unusual now in the winter, and the same applies to other waters in different parts of the country. The smew, one of the most handsome of our sawbill ducks, an almost pure white bird when watched on the water but suddenly transposed to a black and white bird when it takes wing, is a rare winter visitor, though somewhat more occasional in recent years, while the beautiful goosander is usually there once or twice in the winter. In the hard frosts I have watched the sclavonian grebe on the lake, and sometimes in winter the great northern diver pays a visit, though the divers seem much less frequent at Knowsley than they are at Wigan Flashes, where a diver is present most winters, and often a bittern.

Greenshanks and the six common sorts of gull may be seen at the lake, and redshanks, grey plovers and ringed plovers often come up from the Mersey shores in winter. I have watched the water-rail, like a lanky greyish moorhen, near the lake, though it is not at all a numerous bird. Sometimes in summer its ally, the landrail or corncrake is heard in the meadows, but that, too, is rare. Reed buntings, of course, are plentiful here, and in summer the drumming of the courting snipe is audible from the roadway in the park.

It is usual about October to hear a song thrush singing ' sotto voce ' in the shrubbery behind the Hall as one retraces one's steps homewards, and if in November there has been a heavy fall of woodcock, these capricious hunters of the quietest woods not uncommonly flit like great moths out across one's path, and with some subtle movement, double back again into the roadside plantations. A few woodcock nest

in the park every year, and in the summer of 1934 I saw a female crossbill in some yew trees, but found no nest. She was being mobbed by sparrows.

The rest of the park's wild life is not quite so lavish in its abundance as are the birds, for the sanctuary of the park forms a welcome haven for many feathered visitors. I had not seen a squirrel in the park for many years until 1934, and though fox hunting no longer exists in the south-west of Lancashire, occasional ones, perhaps escaped pets, enter the hare holes under the wall. One was found in 1933 and three a few years ago. One of the keepers many years ago said he had caught a pine marten, and such a record does not seem unlikely, though the skin was not preserved for verification. Three years ago a badger was found. There is good pike, tench, bream, roach, perch and trout fishing in the lake, and there was once a twenty-pound pike taken out of the water. Of the flora, the park is one of the few Lancashire localities of the adder's tongue fern, though this lowly plant is very difficult to discern, particularly when not in flower, hidden amongst the grass. Of the rare flowers and plants of Lancashire, the lesser skullcap, shoreweed, hornwort, waterwort and snakeweed are on our records for the park.

When the setting sun sinking behind the beautiful copses of silver birches burns through their delicate tracteries of branches, and the chittering redbreast ticks loudly as one passes, or pauses, at the sudden staccato outburst of a wren, one realises how valuable for the preservation of wild nature and of the countryside are these ancient halls and estates of England.

In addition to the foregoing fauna and flora, there have been further records in past years in the park. An osprey visited the lake in the winter of 1881 and was protected by the then earl, in 1815 four hoopoes were shot by Lord Stanley, and a female honey buzzard in 1888. This gentleman's record of a 'black woodpecker' shot in Knowsley Park has caused wide speculation as to whether his identification was correct or not, as this species is otherwise not on the British list. I am confident that as Lord Stanley (later the 13th Earl and first president of the Zoological Society of London) left much of his recording to others, the term black woodpecker refers to the green woodpecker, for I have often heard this term used (though why, I cannot see) by north-west gamekeepers. Which reminds me of an early record of the little owl from Bath Wood, Ormskirk, usually given as the first Lancashire record. This record is the tawny owl, for young tawny owls fallen from the nest are often called little owls, and I saw in the records of the Liverpool Naturalists' Field Club Library, of which I am librarian, the original

correspondence of this record and the man was not certain of owls at all! To return to Knowsley, a female hen harrier was shot in 1902, while partly white and gynandromorphic pheasants are not infrequent in my records. Byerley, in his *Fauna of Liverpool* (1850) mentions the hobby, and Liverpool Museum has a greenshank from the park. One of the stags lived to the record age of 42 years and at death was sent down to the Natural History Museum, while its portrait, painted in life, hangs over the hall. Before it died, this stag grew so tame that it would enter the great kitchen in cold winters and lie down before the fire. In pre-war days as many as 3,000 pheasants have been shot in a day at Knowsley, but much fewer game is reared now than in those days. J. J. Audubon, the American naturalist, visited the park during his visit to Liverpool a century ago to raise funds for the publication of his *Birds of America*. I have seen his diary notes of his visits to the park with Lord Stanley (late 13th Earl), but there are no notes of interest beyond his noticing the abundance of game.

FIELD NOTE

Blackcap in the Scarborough District in Winter.—

On December 24th I identified a male Blackcap on a tree at the side of Scarborough Mere. My first impression was that the bird was a Marsh Tit, although the place is not a typical habitat of this species. On obtaining a closer view of the bird I noticed the absence of the white patch on the cheeks and the greyish white underparts. With the help of field glasses I was able to come to the definite conclusion that the bird was a Blackcap. I have not seen the species in winter previously, but on looking up the authorities I find Nelson, in *Birds of Yorkshire*, says the bird occasionally occurred in winter. Witherby, in the *Hand List of British Birds*, remarks that it sometimes winters in England, and Coward, *Birds of the British Isles*, also makes the same statement. Doubtless the mildness of our recent autumn is responsible for the bird's presence so far north in December.—T. N. ROBERTS.

SPECIAL NOTE

The photograph of the late Mr. George Bolam, which appeared in Mr. Temperley's article in the January issue, was taken by T. Russell Goddard, Curator of the Hancock Museum, Newcastle-upon-Tyne.

With the title 'Snakes,' a well-illustrated paper on English snakes appears in *The Animal World* for November.

REVIEWS AND BOOK NOTICES.

Proceedings of the Third International Locust Conference, London, September 18th, 1934. H.M. Stationery Office or through any Bookseller. Price 3/6 net., postage extra. This report is printed in English and French and deals with the problems presented by the outbreak areas of locusts and the need for their study. Resolutions dealing with various aspects are presented and the subject matter of the resolutions is given in appendices. There is a discussion on the life cycle of locusts particularly their sexual maturation in relation to climatic and other factors. Field surveys are also dealt with. Resolutions were passed concerning the general problems of all locusts. Resolutions were passed concerning the general problems concerning all locusts. These are that the main object of international anti-locust research must be the delimitation of the outbreak areas, where locusts initiating the outbreak first appear. This is bound up with the study of the life cycle and migration and the factors inducing it. Research is also needed on arsenical and other compounds in locust control and control by means of aircraft. There are also problems which are special to each species, for instance, very little is known about the outbreak areas of the Desert Locust. Resolutions were also passed concerning the arrangements for further international co-operation in anti-locust research. The report gives definitions of terms used. The distribution area includes all territories where the solitary phase lives permanently. The invasion area covers all territory which can be invaded by a species in its swarming stage. The appendices contain a summary of work done in various areas in addition to the subject matter of the resolutions. The report concludes with a map of Africa and Western Asia, showing political and administrative divisions.

Economic Advisory Council, Committee on Locust Control. The locust outbreak in Africa and Western Asia in 1933. **B. P. Uvarov.** H.M. Stationery Office or through any Bookseller. Price 2/- net, postage extra. This report is in continuation of the surveys of 1925-31 and 1932 and discusses the development of the situation up to the end of 1933. The situation has improved greatly with regard both to the Desert Locust and to the Tropical Migratory Locust: On the other hand very alarming developments have occurred in the areas infested by the Red Locust and the immediate prospects in the affected parts of Africa are somewhat disturbing. The Desert Locust. There are several more or less independent areas in the distribution of this species. The areas discussed are the Moroccan-Senegambian, the Algerian-Nigerian, the Sudanese-Arabian, the Somali and the Indo-Persian. The present swarming cycle appears to be gradually dying down. The seasonal cycle in West Africa is definitely established and the connection between the summer breeding south of the Sahara and the winter invasion of the Mediterranean is confirmed. The seasonal cycles of breeding and migration are not as firmly fixed as has been believed. The Tropical Migratory Locust: The swarms of the tenth to twelfth generations are discussed at length. Improvement in the general situation is on the whole maintained. The infested area remains practically the same throughout the eleventh and twelfth generations. The further outlook is hopeful except in the more south-westerly parts of the infested area. The Red Locust: Further data seems to shew another original breeding area in Tanganyika territory. The seventh generation in the southern area is fully discussed. In the northern area the Red Locust was much less numerous in 1933 than in any of the preceding three years. The situation at the beginning of 1934, forbids any but a pessimistic forecast as to future developments. Penetration to the south into the Union of

South Africa is to be expected. The report concludes with an exhaustive bibliography and is furnished with nine distributional maps.

Birds of Great Britain and their Natural History, by W. P. Pycraft, F.Z.S., pp. 206, coloured frontispiece and 29 illustrations (Williams and Norgate, price 7/6). This is a most readable account of the most important phases of bird life from the egg to the full year's activities of the adult bird. The author has maintained a very fair balance in dealing with such a many-sided subject. He is never dull, and his suggestions and conjectures with regard to such matters as egg coloration, nest materials, plumage, migration and a dozen other aspects of ornithology make most interesting reading. Mr. Pycraft is a well-known and experienced ornithologist who states his views quietly and convincingly. The illustrations are clear and well-chosen. A printer's error has crept in on page 109 where in line 13 appears 'gegeneration,' another on page 146 where 'Tengmalm' is given as 'Tengmalim,' and on page 168, line 18 we think the author intended to use the word 'less' where he has written 'more.'

The Botanist in Ireland, by R. L. Praeger, pp. 587, 43 plates, 29 figures and 6 maps in colour, 12/6 (Hodges, Figgis & Co., Dublin). One of the classic British floras is Dr. Praeger's *Tourist's Flora of the West of Ireland*. To those who know that volume, another and more comprehensive flora by the same author will arouse great anticipation, which we think this book will fully meet. It deals with the flora of the whole of Ireland, each area being considered along the lines which distinguish the West of Ireland flora. An introductory section deals firstly with the climate, geology and topography, and then with the history of the flora and its general characteristics to-day. In view of the early isolation of Ireland from Britain and the Continent, much interest attaches to the lists of species absent from or rare in Ireland, but common in Britain. Equally interesting are the data concerning the constituents and the origin of the Iberian and American elements in the flora. This part of the book is valuable, not only as a broad and careful summary, but also in giving references to the pertinent sources of information as to the post-glacial changes in the Irish flora. Following it comes a section on the rare and interesting plants in Ireland, and then, in full, descriptions of the most noteworthy features of the vegetation in different parts of the country. The feature which makes this section particularly valuable is the ecological background which is maintained throughout. Not only the rarer species in each area are mentioned, but generally also the type of plant community they are found in and very frequently lists of characteristic plant associations. It is thus possible to get a clear idea of the vegetation as well as of the distribution of the rarer species. The volume concludes with a census list giving the vice-comital distribution of the individual species. The whole is an admirable and useful volume. It is well indexed, adequately supplied with cross references, and the illustrations and maps are excellent. It makes a fitting and worthy conclusion to Dr. Praeger's exhaustive studies on plant distribution in Ireland.

A Romany on the Trail, by G. B. Evens, pp. 172, illustrated with plates and text figures (3/6 net, The Epworth Press). This is an addition to the series of books dealing with country life by G. B. Evens, the *Romany of the B.B.C.* In it the author tells further of his experiences with his dog in the country. The book is written in an interesting manner, and it is evident that the author possesses both a catholic taste and a discerning eye. The illustrations include both plates (photographs) and also line drawings. The result is a book in which all nature lovers will find something of interest, although stories of bird, fish and animal life predominate. These are the result of keen and varied observation.

THE YORKSHIRE NATURALISTS' UNION'S SEVENTY-THIRD ANNUAL REPORT FOR 1934

(Continued from page 24)

G. R. Edwards, V. S. Crapnell, and W. Greaves have jointly supplied me with the following valuable notes from the Halifax district, and chiefly from White Holme reservoir (1) and Blackstone Edge reservoir (2), both on the Lancashire border.

A Greenshank on September 2nd, and two on September 16th and 23rd (1), and one on September 8th (2), and another at Fairburn on August 14th (G.R.E.). Three Sanderlings on July 29th (1). A Turnstone on August 19th (2), and three on September 2nd (1) in company with six Curlew Sandpipers. A Ruff on August 11th on Luddenden Joint Board Sewage Works, and another at Fly Flatts reservoir September 1st, and three on September 9th (1). A Green Sandpiper on August 11th and 12th, and another on August 20th, on the Luddenden Joint Board Sewage Works. Four Grey Plovers on September 30th (1). In addition to the above on August 12th they saw a small species of Stint, which they were unable to identify owing to its wariness and wildness (1).

Mr. Crapnell thinks there must be a regular passage movement of Ringed Plovers through this district, as the birds are seen so regularly. One was seen on May 19th at High Royd (G.R.E.), two by them on May 28th (2); one on July 29th (1); one on August 5th (2); six on August 12th (1); four on August 26th (1); two on September 9th (1); two on September 23rd (2); and two at Withens reservoir on the same date; and two on September 30th (2).

VARIATION IN PLUMAGE.—The keeper reported another young white Cuckoo on Embsay Moor, but as he only saw it for a very short time he presumed that it had perished. A white Blackbird was reported at Gargrave (F. J. N. Duffy). I last heard of the Albino Song Thrush at Menston on Christmas Day, 1933.

East Riding (C. W. Mason): Some interesting records are:—

LESSER TERN arrived at Spurn April 26th, first nest seen May 20th.

CORNCRAKE.—This bird has only been heard twice in our district this year.

SWALLOW.—More common than usual.

SWIFT.—A bird was seen on October 4th at Brandesburton.

North Riding (W. J. Clarke): During the year Common Sandpipers, Grey Wagtails, Lesser Redpoles, Goldfinches, Jays, and Partridges have been more abundant. Wood Warblers have been much more so in the Scarborough district, but have not been so much in evidence around Whitby.

Greenfinches, Yellow Hammers, Ring Ouzels, Golden Plover, Whimbrel, Stonechat, Redstart, Chiff Chaff, Sedge Warbler, House Martin, Sand Martin, Brambling, and Common Scoter have not been as common as usual.

A pair of Hawfinches nested at Egton Bridge. A melanic variety of the House Sparrow, all sooty black above and below, was shot at Cross-gates, Seamer, on January 21st, 1933. The bird was a male. An Albino Sparrow all white with the exception of a very few brown feathers

is living in my garden at the time of writing (October 14th, 1934). A flock of seventeen Siskins was seen near Whitby in November, 1933, and three males and one female were seen near Scarborough by Mr. W. A. Clark on April 15th, 1934. A pair of Reed Buntings nested this spring near Whitby, a few odd Snow Buntings were seen there during the winter and also a pair of Yellow Wagtails during April, 1934. This species has not visited its old haunts near Scarborough for several years. Reed Warblers returned to the Mere at Scarborough, but no nest was seen, or sought for. Two pairs of Grasshopper Warblers nested near Scarborough, and this species was also seen and heard near Whitby. Dippers nested in all their usual haunts, and Kingfishers were seen in usual numbers. Swifts were abundant during the summer and have delayed their departure to a very late date, as individuals and small parties were seen constantly up to October 7th. Velvet Scoters were seen at Whitby in November, 1933, and January, 1934. Common Scoters were scarce, but eight were seen on Lockwood Beck reservoir, near Whitby, on June 11th, an unusual date. Two pairs of Teal were seen on Foul Sike on May 30th, and a brood of young ones was seen there with the mother. A Ruff was shot on the Derwent below Ayton on September 25th, 1933. Little Gulls, possibly the same individual, were seen during December, 1933, and January and February, 1934. The bird, or birds, were in adult plumage. An immature Iceland Gull was seen on December 7th, 1933, and another in very white plumage on April 28th, 1934, both at Whitby. A Glaucous Gull in second year's plumage frequented the Scarborough harbour from February 7th to February 15th, 1934. An immature example of this species remained at Whitby from November, 1933, to February, 1934, and an adult was picked up dead at the same place on February 20th, 1934. A ringed Common Gull caught at Scarborough on April 22nd, 1934, and subsequently released without the ring, was marked at the breeding ground Kvarinskar, Vendelsofjorden, Province of Halland, Sweden, on June 14th, 1933. Black-headed Gulls nested at Foul Sike in considerable numbers this year. About 400 pairs were there on May 30th, 1933, and the islands were crowded with nests but all had been robbed. As there was not sufficient room on the islands a number of pairs had built their nests in the dense reed beds fringing the water, here a few overlooked nests contained from one to three eggs. For the first time to my knowledge about a dozen pairs of Herring Gulls nested this year on the Castle Cliff at Scarborough. The young birds could be seen in the nests and on the ledges while yet unable to fly. Many oiled diving birds—Guillemots, Razorbills, and Puffins—were to be seen on the beach at Scarborough during June, and hundreds of corpses were reported further south at Flamborough and Bridlington. Fulmar Petrels arrived on the Castle Cliff at Scarborough as early as January 1st, and were abundant on January 13th, when much fighting for nesting sites was taking place. They were more numerous than in previous years at Scarborough, and about the same as in previous years near Whitby. A Slavonian Grebe was shot on the Newton House Estate on February 24th, 1934. Three Little Grebes were seen on Lockwood Beck reservoir during October and November, 1933, but have been scarce during the present year. A Great Crested Grebe was seen at the same place on September 15th, 1934. Landrails occurred in normal numbers in the Whitby district, but are still scarce in the Scarborough area. Coots still flourish as a breeding species upon the Seamer Mere, and Throxenby Mere, near Scarborough; 150 individuals were seen on the Lockwood Beck reservoir on January 9th, 1934. Red-legged Partridges nested near Whitby in 1934, and two were shot. A migrating specimen was captured alive near the Marine Drive at Scarborough on March 17th, 1934. Red Grouse are making a good recovery on the Whitby Moors, after the disease of 1931-32, but the numbers are still below normal.

The Recorder is very grateful to Messrs. A. S. Frank, F. Snowdon,

T. N. Roberts, and W. Newlove for information which has been used in the compilation of these reports.

York District (Sydney H. Smith, F.Z.S.) : Several Little Grebes were seen in the River Foss at Huntington on January 11th ; they are not uncommon in the district and have nested on various ponds within the city boundary.

A flock of Siskins was feeding on sedges beside the Foss on the same date and place, and stayed until the 25th.

The Thrush was first heard singing on January 14th, seven days later than usual.

During February a party of Bullfinches, seven males and four females, stripped fruit trees of buds at Huntington, plum trees suffered particularly, with a consequent scarcity of plums later in the year. These birds have greatly increased, and nests observed at so many points around York as not to be worth individual record.

Redwings were numerous and Fieldfares less common, a large flock of the latter being seen as late as April 27th at Huntington.

Goldfinches are now quite re-established and nest in various local apple orchards.

Hawfinches nested at Huntington, and on May 15th four eggs were seen, and the young later on were reared.

A dipper's nest with four eggs was found at Thirkleby on April 8th.

Curlews still frequent nesting haunts on Alne Moor and Strensall Common, a nest with three eggs being found at Strensall on May 30th.

Tawny Owls are common around York, four nests were found and also a nest of the Barn Owl.

Little Owls are reported from Huntington, Flaxton, Sandburn, Escrick, Kilburn, and Crayke, and are an undoubted nuisance to gamekeepers.

Cuckoos have been fairly numerous : an unusual foster parent was noticed at Huntington, where a pair of missel Thrushes had their nest in an apple tree, and later were seen busily engaged feeding a young Cuckoo they had hatched with their brood.

Nightjars were scarce this summer, one pair nested at Strensall and another pair at Suet Carr. They were also seen at Skipwith.

A Nightingale was singing at Waplington on May 28th, but no nest was found.

Linnets have been more than usually common, and there is an increase in number of Common Buntings.

A pair of Grasshopper Warblers and two pairs of Wood Warblers nested in Huntington Wood, and at the same place two pairs of Woodcock nested successfully.

I visited the Heron colony in the Shire Oaks Wood at Healaugh on May 23rd, where eleven pairs had nested. The young birds were strongly on the wing and afforded a magnificent sight as they circled overhead.

The Landrail or Corncrake has almost disappeared. One was heard at Kirby Misperton on May 11th, and I heard another in June near Stamford Bridge. There may have been others in the district not reported to me.

Jays, Magpies, and Carrion Crows have been as numerous as last year, although a lot were destroyed by gamekeepers.

On July 2nd a Black Swan was seen in the River Ouse at Linton,

and later it passed over York following the river, no doubt the bird had escaped from some private lake.

On August 14th an unusual visitor to the River Foss at York was a Cormorant. This bird appeared to have got into difficulties with some oil and probably ascended the Ouse to York (seventy miles from the sea). I saw it busily disposing of roach, which it caught readily. Later it was caught by boys, and arrangements to release it at night to enable it to get away, were successful.

The protection afforded Green Plovers in Yorkshire has had the effect of forming very large flocks; they are joined extensively by Golden Plovers, and I saw about 100 of the latter species at Raskelf on September 8th.

The dry summer must have favoured Partridges, as there are some excellent coveys around York, particularly on light land around Easingwold and Raskelf.

ARRIVAL OF SUMMER VISITING BIRDS.

WILLOW WARBLER	...	Bulmer, March 31st.
WHEATEAR	...	Farndale, April 14th; Hawnby, April 15th; Strensall, April 25th.
CHIFF CHAFF	...	Huntingdon, April 15th.
SANDPIPER	...	Hawnby, April 15th.
PIED FLYCATCHER	...	Hawnby, April 15th.
SEDGE WARBLER	...	Huntington, April 16th.
SAND MARTIN	...	Stamford Bridge, April 16th.
SWALLOW	...	Pocklington, April 16th; Waplington, April 21st; Haxby, April 26th.
REDSTART	...	Huntington, April 19th.
GARDEN WARBLER	...	Huntington, April 19th.
WHINCHAT	...	Strensall, April 21st.
CUCKOO...	...	Strensall, April 23rd; York, April 23rd; High Catton, April 24th; Huntington, April 25th.
HOUSE MARTIN	...	Waplington, April 26th; Earswick, April 27th.
LANDRAIL	...	Kirby Misperton, May 11th.
SWIFT	...	Haxby, May 15th (1); Huntington, May 15th (1); Huntington, May 19th (2); and May 20th (20); Kirby Misperton, May 19th.
NIGHTJAR	...	Strensall, May 15th.
TURTLE DOVE	...	Tadcaster, May 20th and June 5th.

For valuable help in compiling these notes, I am again indebted to Mr. V. G. F. Zimmermann.

WILD BIRDS AND EGGS PROTECTION COMMITTEE

Subscriptions for Season 1934

	£	s.	d.		£	s.	d.
Alderman Hirst ...	5	0	0	Mrs. L. M. Bilbrough...	0	10	0
J. W. Dent, Esq. ...	2	0	0	V. G. F. Zimmerman,			
A. B. Ward, Esq. ...	1	1	0	Esq. ...	0	10	0
H. B. Booth, Esq. ...	1	1	0	W. Bennett, Esq. ...	0	10	0
W. McMillan, Esq. ...	1	1	0	Capt. Evans ...	0	10	0
T. Waddington, Esq. ...	1	1	0	A. E. Boycott, Esq. ...	0	10	0
F. H. Edmondson, Esq. ...	1	0	0	S. D. P. Fisher, Esq. ...	0	5	0
Miss Waterhouse ...	1	0	0	T. N. Roberts, Esq. ...	0	5	0
R. H. Edmondson, Esq. ...	1	0	0	G. Battie Bisat, Esq. ...	0	5	0
Sir H. Smith ...	1	0	0	R. Butterfield, Esq. ...	0	5	0
H. J. Wilkinson, Esq. ...	1	0	0	Scarborough Naturalists'			
York F. N. Society ...	1	0	0	Society ...	0	5	0
W. G. Bramley (1934-5)	1	0	0	W. Greaves, Esq. ...	0	5	0
H. J. Behrens, Esq. ...	0	10	6	W. E. L. Wattam, Esq. ...	0	5	0
S. H. Smith, Esq. ...	0	10	6	J. H. Rowntree, Esq. ...	0	5	0
E. B. Gibson, Esq. ...	0	10	6	W. F. Fearnley, Esq. ...	0	5	0
C. F. Procter, Esq. ...	0	10	6	Mrs. Wood ...	0	2	6
C. W. Mason, Esq. ...	0	10	6	W. Waterhouse, Esq. ...	0	2	6
E. W. Taylor, Esq. ...	0	10	6	Mrs. W. Kaye ...	0	2	6
R. Chislett, Esq. ...	0	10	6	A. Wood, Esq. ...	0	2	6
W. J. Forrest, Esq. ...	0	10	0	Miss Moorhouse ...	0	2	6
W. G. Birch, Esq. ...	0	10	0	E. Hallowell, Esq. ...	0	2	0
W. J. Clark, Esq. ...	0	10	0	Rev. W. L. Schroeder...	0	1	0
J. J. Brigg, Esq. ...	0	10	0				
Mrs. Ewing ...	0	10	0				
Mrs. J. S. Binns ...	0	10	0				
					£30	8	0

Preliminary Balance Sheet, Season 1934

INCOME.	£	s.	d.	EXPENDITURE.	£	s.	d.
Subscriptions as per list	30	8	0	WATCHERS—			
Balance from last year	19	19	2	J. Medcalfe, plus			
				Insurance ...	13	16	9
				J. Clubley ...	6	15	0
				J. Green ...	3	0	0
				Printing and Stationery	0	19	0
				Postages and registered			
				Envelopes ...	1	10	9
					26	1	6
				Balance in hand ...	24	5	8
	£50	7	2		£50	7	2

MAMMALS, AMPHIBIANS, REPTILES AND FISHES COMMITTEE

Mammals (W. G. Bramley): I should like to emphasize the Chairman's appeal for more workers in this section and also to other members of the Union to send me any information they may obtain during the year, more especially with regard to the smaller mammals.

In the Scarborough area Field Voles are reported to be scarce, but this does not apply to most of the other parts of the county, where they

are gradually increasing and are more in evidence than during the past two years. Stoats and Weasels are fairly abundant, but in Holderness there has not been an increase in rats such as one would have expected following two good seasons and a mild winter. After decreasing during the past three years the Black Rat seems to be on the ascendant at Scarborough. Of fifty-six Rats killed about the harbour and piers between April 1st and October 1st, fifty-one were Black Rats, but this does not include all the Rats killed during the period.

Hares and Rabbits have had a good year. The Scotch Hare is now gradually extending northwards and Mr. W. Greaves informs me that they can be seen almost any time on the Rishworth Moors.

In the North Riding there is evidence of a small but gratifying increase in the numbers of Red Squirrel. In spite of persecution the Grey Squirrel is also increasing in numbers in most of its haunts, and is also extending its range. One was seen in the middle of Black Pits Moor (Whitby) far removed from trees. In the York district they are frequently seen near the city.

Otters shew no diminution of numbers and are abundant round York. A pair brought up a litter of cubs on the Foss at Huntington. On March 19th they had taken toll of the Roach, whose scales and other remains littered the bank in several places. One found dead at Saltaire (River Aire) weighed 18 lbs. and had probably died from blood poisoning, the only injury being a small cut on one foot, that leg and the intestines being inflamed.

A Porpoise was seen in the Ouse at Selby on April 29th, and another 5 ft. 7 in. long, weighing 10 stone, was shot at Stillingfleet by W. Kendall, of Cawood.

A Common Seal was caught at Scarborough by a local angler after it had taken a hooked codling. Unfortunately the animal was killed. Several others have been seen in the same locality.

A young White-sided Dolphin, 47 in. long, was caught out of a herd of about fifty on July 11th, 27 miles N.E. of Scarborough. It had not then cut its teeth. In the Lowestoft and Yarmouth districts the fishermen call them 'Scoutlers.'

Reptiles.—Vipers emerged from their winter quarters on the Moors near Scarborough at an early date. On March 22nd the first was seen by the late Mr. E. B. Lotherington, who also saw four on the 23rd of the same month, and seven on the 25th. Eight were killed at Cloughton on March 25th.

Amphibians.—Mr. C. F. Procter writes: I have been astonished at the number of small frogs which have suddenly appeared, apparently from nowhere after a shower, and can readily understand the firm belief that these come down from the skies during thunder. On two occasions a pasture has produced hundreds of young frogs along the hard paths after rain, and one can only assume that they are amongst the grass all the time and come to the paths under the quickening influence of their native element.

The convener, during a short visit to Gormire in August, noted the large number of young Toads there, a feature noted some years ago about the same time.

Marine Fishes (W. J. Clarke): 1934 has been remarkable for the unusual number of Shads which have been caught off the coast. Thirty-four examples of the Twaite Shad have been taken in the trawl nets, about 12 to 20 miles from land, and one was caught by an angler fishing from the East Pier at Scarborough. Three examples of the Allis Shad have also been taken during January of this year by Scarborough trawlers. On January 14th a Saury Pike, or Skipper, was stranded alive in Carnelian Bay. On the 29th of the same month a Sea Snail was taken from the

stomach of a Cod caught near Scarborough. On the 30th a small Sturgeon of 20 lbs. weight was caught 20 miles south of Scarborough. On February 3rd a small Short-spined Sea Bullhead, 5 in. long, was taken from the stomach of a Cod caught in Burniston Bay. On examining it, I found that the Bullhead had swallowed a Zarrell's Blenny exactly its own length. This is the fourth Yorkshire record I can trace for this rare fish. On March 28th, 1934, a Snake Pipefish, 16 in. long, was caught in a crabpot set close inshore in Scarborough South Bay. On May 31st I found a Pilchard among the Herrings landed on the fish market. A Great Forkbeard was caught in the trawl nets 38 miles E. by N. off Scarborough on June 13th, 1934. The first Tunny were seen off Scarborough on July 12th, and on the 15th many were reported. During the summer fifty-six of these fish have been landed at Scarborough and Whitby between August 4th and October 4th, 1934. The weights ranged between 335 lbs. and 812 lbs. On July 31st a Thresher Shark 13 ft. in length was caught at Whitby. Porbeagle Sharks from 6 ft. to 8½ ft. in length were very abundant off Scarborough during the summer. On August 21st, two anglers caught five of these fish on rod and line, and many others were caught by the Tunny fishers, to whom they were a nuisance. A Black Sea Bream 12 in. in length was taken from the stomach of a Cod caught near Scarborough on October 1st. This fish is not common off the Yorkshire coast.

Of fresh water fish the Stone Loach has been noticeably abundant this year in the Esk at Egton Bridge, and it is still common in Scalby Beck. Grayling have completely disappeared from the Egton reaches of the Esk in recent years. One or two Planers Lampreys were seen swimming in the Derwent at Forge Valley during the summer.

CONCHOLOGICAL SECTION

Conchology (Mr. J. R. Dibb) : The first field meeting held in June, when the section visited Acomb Brickponds, York, was not well attended, and nothing of particular interest has been reported. It was found necessary to hold the Bentley excursion on September 25th instead of September 1st, when our numbers were strengthened by making this a joint-meeting with the Doncaster Scientific Society. Good work was done upon this occasion. On the whole shells have apparently been adversely affected by last summer's exceptional drought, and the season has been a poor one. The Annual Meeting was held in Leeds on October 20th, with the President of the Section, Mrs. E. M. Morehouse, in the Chair. It has been proposed to arrange excursions to York and Ledston in June and September respectively for the next session.

(Mrs. Morehouse says) : Very few reports of unusual molluscs have come to hand this summer or varieties of molluscs occurring under conditions worthy of note. *Limnæa pereger* Müll, in a cattle pond at Thorner, had the ordinary pale horn coloured shell, but a perfectly white animal, a pure albino ; these were found by Mr. Kenneth Howell. Each brood bred and kept in captivity from the original stock, show the same peculiar feature. On the banks of the Ouse, at Ousefleet and further along the embankment, *Arion ater* v. *aterrima* Taylor, were to be seen in large number, but not one type *Arion* was observed, the only other variety being v. *brunnea* Roebuck, only five of these being noted the whole day.

ENTOMOLOGICAL SECTION

Hemiptera (J. M. Brown) :—Until the season's collections are more fully worked up there appears very little of interest to note. Reports on material obtained on the Union's excursions to Farndale and Bainbridge have already appeared in *The Naturalist*, and a list of Cleveland

species collected by the late Mr. M. L. Thompson was published in the April number.

The most interesting species recorded in Mr. Thompson's list are :

HETEROPTERA.

Temnostethus pusillus H.S., from Kildale.

Brachyceraea annulatus Wolff, from Saltburn.

HOMOPTERA.

Deltocephalus halophilus Edw., from Middlesbrough.

D. pascuellus Fall., also from Middlesbrough.

D. sabulicola Curt., from Redcar.

Delphacodes uncinata Fieb., from Saltburn.

During the excursion to Semerwater several species of some interest were taken.

HETEROPTERA.

Dipsocoris alienum H.S., occurred under shingle in Mill Ghyll, thus adding still another locality for this local species.

Micronecta minutissima L. was present in enormous numbers in the immature condition in the River Bain and in Semerwater.

HOMOPTERA.

Megamelus notula Germ. and *Delphacodes denticauda* Boh. were taken by sweeping.

Teratocoris saundersi D. and S., a species hitherto recorded from only a few stations in the county, seems to have been more prevalent this season, having been taken by the recorder by Semerwater and by the lake at Renishaw Park, and by Mr. Thompson in Cleveland, and *Stenotus binotatus* F., another rather local species in the county, occurred in Renishaw Park (near Sheffield).

Mr. W. P. Winter sent in specimens of a species which has been responsible for a considerable amount of damage to the vegetation in Manningham Park, Bradford. So far as recognisable from the damaged condition of the insects, the species is the common *Lygus pabulinus* L.

Plecoptera (Stoneflies) (J. M. Brown) :—It has already been noted in *The Naturalist* that many of the species which commonly emerge very early in the season were distinctly late in coming on the wing this year. This applies to such a species as *Capnia vidua* Klap. and *Protonemura meyeri* Pict. Furthermore, in the recorder's experience, Stoneflies as a whole have been less numerous than usual during this past season. This, however, does not agree with the experience of Mr. J. Wood for the Keighley district. Few notable captures can be recorded. *Perlodes mortoni* Klap. occurred in Farndale, and a specimen was sent in by Mr. Winter taken near Bradford by Mr. G. E. Gallagher. *Protonemura precox* Mort. and *Nemoura avicularis* Mort. occurred in Farndale, and *Nemoura cambrica* Steph. at Bainbridge.

Psocoptera and Collembola (J. M. Brown) :—Nothing special to report.

Neuroptera (J. M. Brown) :—In addition to the more common species, *Hemerobius marginatus* Steph. was taken in Semerdale.

Odonata (G. E. Hyde) :—*Sympetrum scoticum* Don was noted in reasonable numbers near Doncaster on September 9th. *S. sanguineum* Müll. was common on the day in the same locality, and *Æschna grandis* L. was seen.

Diptera (Chris. A. Cheetham) :—In many ways the past year has been similar to 1933, a year whose type of weather promised a far more successful collecting time than the results have shown. Apparently

in a fine time insects are able to get through their flight and mating time quickly, and so are less noticeable than in a year of unsettled weather, when this is prolonged.

Perhaps the most interesting addition to our list this year is *Tipula macrocera* Zett. from Ingleborough. I saw another uncommon species, *Tipula irrorata* Mcq., fairly plentiful in a small wood at Lawkland at the end of June. Several additions are found in the lists of captures on visits of Dr. Edwards and Mr. J. E. Collin, and amongst the latter some new species are to be described later.

Interesting captures on our excursions are *Ceroxys crassipennis* F. and *Cnemopogon apicalis* Mg., caught at Fairburn, where *Eristalis sepulchralis* L. was plentiful, and *Paroxyna* (*Tephritis*) *plantaginis* Hal. from Ousefleet, where two interesting mosquitoes were caught, *Ochlerotatus waterhousei* (Theo.) and *O. annulipes* (Mg.).

Coleoptera (W. D. Hincks) :—Members of the Coleoptera Committee wish to place on record their deep appreciation of the work of the late Mr. M. L. Thompson, whose loss will be such a grievous one to the Committee and to the Union as a whole. Work of the greatest value on the coleoptera of the county has been accomplished by Mr. Thompson, whose enthusiasm and unabating interest has been an example and encouragement to the young members of the section who have benefited greatly by his kindly interest and help. Older members have lost a friend of long standing, the Union a consistent attendant at the meetings and a staunch supporter in every way.

His unforeseen decease has deprived the Committee of its Chairman and Recorder, so that the writer has put together the following scanty notes on the season's activities on the principle of 'a little is better than nothing at all.'

It has proved difficult to estimate the relative abundance or otherwise of beetles during the season as compared with previous years owing to the few excursions made, but the general consensus of opinion seems to suggest that the past season has been, on the whole, a poor one for coleoptera.

Mr. J. R. Dibb notes *Caenopsis fissirostris* Walt. from Adel Moor in *The Naturalist*, 1934, p. 55. This is a new county record, and the first from the North of England. The previous most northerly record appears to be Cannock Chase. A similar previous distribution is recorded by the late Mr. Thompson for *Lesteva fontinalis* Kies. (*Nat.*, 1934, p. 157), who adds this to the county list on specimens taken at Askrigg in 1914.

Beetles were rather plentiful on the occasion of the section meeting to Spa Gill Woods in June, a full report of which is in the press. Mr. Hincks took a single example of *Phyllotreta tetrastigma*, which appears to have been previously found in the county only at Studley in 1905 by Mr. Thompson. *Dryophilus pusillus* was by no means uncommon sweeping grass, and a noteworthy feature was the numbers of species present of the genus *Malthodes*. The following were taken: *M. pumilus*, *dispar*, *marginatus*, *mysticus*, *minimus*, and *fuscus*. *Magdalis armigera* occurred several times, and Mr. Barnes took another species which the writer has not yet seen.

During the year a large collection of Keighley and other coleoptera, brought together by Mr. John Wood, have been partially examined. This contains several items of interest, and it is hoped to publish some notes on the material in the near future. The following may be mentioned here: *Tetrops praeusta*, Allerthorpe; *Selatossomus impressus*, Shipley Glen (new to V.C.); *Deronectes borealis*, Keighley; *Aphodius foetens*, Askham Bog, and *Quedius ochripennis*, from wasps' nests, Keighley.

Mr. Philip D. Hartley made an interesting capture at Appletreewick of a specimen of *Tetropium gabrieli* var. *crawshayi*, off larch. This record seems to point to the species being definitely established here. The

only other Yorkshire records are, it is believed, specimens of non-Yorkshire origin imported in timber and noted by Mr. Bayford.¹

A recently identified example of *Cassida flaveola* was taken by Mr. Dibb at Adel Dam in 1917.

The writer records *Limonium minutus* at Askham Bog, 21/5/34, and *L. aeruginosus* at Spa Gill Woods in June.

An example of *Ips laricis* has been found by the writer in his house in Leeds, but it seems probable that this has been introduced with larch and other wood used in the garden.

Hymenoptera (R. Butterfield) :—In the spring and summer months rainfall was considerably below the average amount, and as regards the aculeata the long drought proved favourable for Fossore; dominant species of *Pompilus* and *Salix* especially were much in evidence. Spring species of bees were not uncommon, but taking into account the warm and sunny summer, some species of bees and wasps, solitary and social, have not appeared as plentifully as during seasons apparently less favourable. My own activity in collecting has been desultory. Mr. J. Wood has acquired a good number from near Keighley and elsewhere, some of which are mentioned in *The Naturalist*. Among his Keighley series is a female *Vespa austriaca* Panz. It would be interesting to know its host. He obtained varieties of *Andrena clarkella*, and series of *A. lapponica* Zett. and *A. analis*, also *Nomada lathburiana* and *N. flavoguttata*.

In May I secured a male *Anthophora furcata* on bloom of dead nettle at Ruswarp, Whitby. The species of this genus for some reason avoid the western area of the county. In July I noticed an example of *Agenia variegata* interested in a spider on a window pane of my home. This active fossor is recorded by F. Smith from near Wakefield. Since his time it has been seen once only in Yorkshire, though it may have been overlooked.

The species of *Odynerus* have not been common, except *O. pictus*, in places under my notice. Mr. A. E. Winter captured at Harrogate *O. trifasciatus* or *O. trimarginatus*. He also obtained a melanic specimen of *Vespa vulgaris*.

Tenthredinoidea (W. D. Hincks) :—I very much regret that I have been able, on two occasions only, to collect sawflies within the county during the season. My regret is the greater because on both days sawflies were more than usually abundant. On the 21st May I visited Askham Bog with Mr. John Wood for quite another purpose, but on finding sawflies plentiful attention was turned in that direction. I have not yet seen Mr. Wood's material, but mine comprised twelve species mostly common kinds, but nevertheless very interesting and often numerous. The most striking feature was the extreme abundance of the funereal Blennocampid, *Rhadinoceraea micans*, which was everywhere on *Iris pseudacorus*, its food plant.

Another interesting species, unfortunately represented by a single example only, was *Pamphilus sylvaticus*.

Whereas the visit to Askham Bog produced abundant *Doleri*, Spa Gill Woods on June 23rd, a month later, produced mostly *Tenthredella* and allied forms. Here representatives of over twenty species were taken, of which two appear to be previously unrecorded in the county. These are *Hartigia linearis*, taken by myself, and *Arge ciliaris*, taken by Mr. Dibb. Other noteworthy species were *Cephus pallipes* and *Stromboceros delicatulus*, of which, however, the last is a common though frequently overlooked species. At the annual meeting of the Entomological Section, Mr. A. E. Winter exhibited a female specimen of *Sirex*

¹ Mr. Walsh has recorded this species under apparently natural conditions in East Yorks. The present record is a new V.C. one.

noctilio, one of a number which emerged from a wooden floor of a building on the Rudding Estate, Follifot, near Harrogate. *Sirex gigas* has been noticed in several pine woods this year.

Lepidoptera (G. E. Hyde) :—In spite of the dry weather conditions in the early spring, low night temperatures retarded early varieties of lepidoptera, and the hibernated larvæ were considerably later in re-appearing than in 1933. Larvæ of *Boarmia repandata* (Mottled Beauty), collected at night near Doncaster, produced interesting dark forms of this varied moth. Larvæ of various night-feeding noctuæ were abundant during the first half of May. The conspicuous larvæ of *C. potatoria* (Drinker Moth) were very numerous, but quickly dwindled and became decidedly scarce towards the end of the month. No doubt their ranks were thinned by the cuckoos, which are common locally. *P. napi* (Green-veined White Butterfly) was not noticed until May 5th; in 1933 it was well out by April 13th. *P. brassicae* (Large White) was extremely scarce. *C. typhon* (Large Heath) appeared in reduced numbers; most of the best ground was badly burnt in 1933. The hot weather in June and July accelerated the development of many moths and butterflies, and, as in 1933, various kinds of normally single-brooded species produced a second brood. Amongst others were included *S. populi* (Poplar Hawk), *D. vinula* (Puss), and *A. rumicis* (Knot Grass).

Larvae of *C. elpenor* (Elephant Hawk) were discovered in many places in the district, and a reported nest of 'adders' sent to the museum proved to be five of these giant caterpillars. Both green and brown forms of the larvæ were noted.

V. urticae (Small Tortoiseshell) was numerous, but *P. atalanta* (Red Admiral) was rather scarce, and did not appear until September.

A few *P. cardui* (Painted Lady) were noted in September. Several species of the beautiful 'Plusia' moths visited valerian in the garden, and *P. moneta* (Golden Plusia) and *P. chrysis* (Burnished Brass) were double brooded.

Mr. R. Butterfield adds: In May last I saw a small colony of *Argynnis euphrosyne* south of Levisham railway station on the slopes of a woodland glade near the railway line.

NEWS FROM THE MAGAZINES

Dean Inge has expressed the following opinion on modern art: 'Modernist art—sculpture, painting and architecture—recalls now the productions of an African savage and now those of a very unpleasant child. Modernist poetry will not scan, and it is usually unmitigated drivel. . . . Another unpleasant sign of barbarisation is the sight of young women with splashes of crude red on their lips and nails. To my eyes, this is as repulsive as the similarly tinted patch which colours the stern of a baboon. . . .'

In an article on 'Taints in Milk' appearing in *The Mill-Stone* for October, issued by the British Oil & Cake Mills, Ltd., we learn that 'Several species of chamomile are known to produce a strong chamomile flavour in milk, the worst of which is the stinking mayweed (*Anthemis cotula*). The chamomiles are very seldom found on old pastures, but grow on arable land and are sometimes found on "seeds" and in "seeds" hay. Hay which contains chamomile should not be fed to cows in milk. The wild tansey (*Tanacetum vulgare*) and yarrow or millfoil (*Achillea millefolium*) can cause a similar but less pronounced taint. Oak leaves, ivy leaves, and buttercups, if eaten in sufficient quantity, produce a bitter flavour. Buttercups are quite innocuous in hay. Other plants which occasionally cause trouble are charlock (*Brassica sinapis*), dog daisy (*Chrysanthemum leucanthemum*), ramsons (*Allium ursinum*), and wood-wax (*Genista tinctoria*).'

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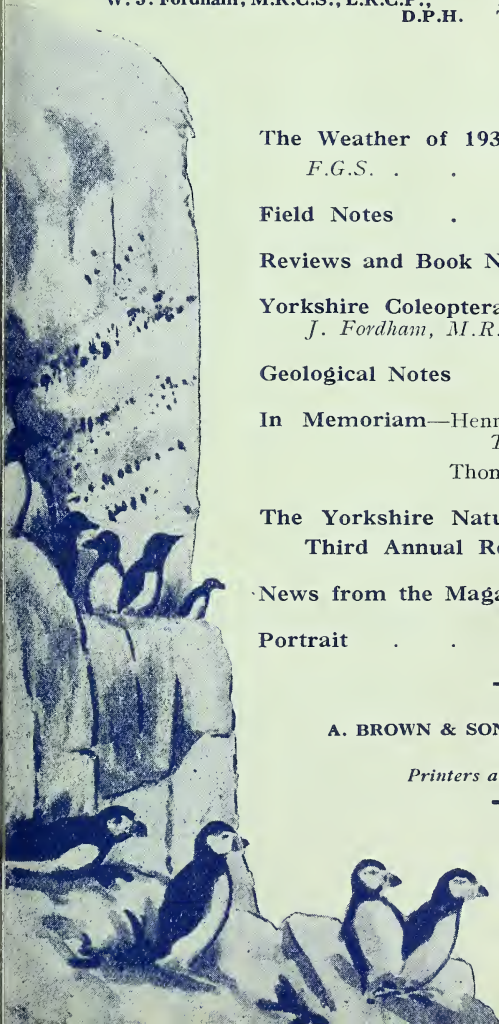
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THE WEATHER OF 1934

J. A. BUTTERFIELD, M.Sc., F.G.S.

ONE of the responsibilities of the Botanical and Zoological Sections of our Union is the compilation of a series of annual records indicating the many seasonal and other phases of plant and animal life which tend to vary according to their actual time of happening and abundance with the years. Such records are of interest in themselves and can be found scattered through the annual reports of the various sections, and as short records in *The Naturalist*. Usually, however, there is little attempt to correlate these records with the factor which is the prime cause of their variation, namely the weather. Unless such correlation is attempted these records lose much of their scientific value.

The past year has been an exceptional one in many aspects of weather and we believe that it might be useful to survey some of its general features in order that some of the rather unusual plant and animal records might be better understood. If such a weather report proves of use it may be offered as an annual feature and may lead to the establishment of a section in the Union devoted to the accumulation and study of phenological records.

The main climatological features which are responsible for seasonal movement and response in plants and animals are temperature, rainfall, sunshine and humidity, with strong gales as a factor in driving many sea-birds inland at unexpected times. The most important factor in the plant is local weather, but the animal is very often influenced by the weather of surrounding areas. In the following report the weather of the past year will be described for the British Isles generally, then actual records will be given for a few Yorkshire stations. Limitations of space permit of only a very general outline. Those who wish to have more details should refer to the summaries given each month in the *Meteorological Magazine*, or to the various weather reports issued by the Meteorological Office.

January opened the year with mild unsettled weather, though sunshine was generally above the average. Towards the middle of the month storms developed with frequent gales accompanied by rain, with sleet and snow in the north. The second half of the month produced quiet sunny weather but this gave place to unsettled weather towards the end of the month. February began with gales on the east coast, slight general drizzle and occasional keen night frosts. By the middle of the month fair sunny conditions were experienced over most areas and this continued in the south, although in Scotland the weather remained cloudy and showery. Mist

or fog was prevalent especially in the south-east. The last few days of the month were accompanied by local snowfalls, Yorkshire experiencing a heavy fall on the 27th. The peculiarities of February were the long period of absolute drought reaching over three weeks in some places and the record sunshine duration in some areas.

March was a wet month in all areas except Scotland and N.W. England. Sunshine was above the average in Scotland but below normal in the south of England. Unsettled weather held generally throughout the country with showers of snow, sleet and hail. During the first half of the month local thunderstorms were common. During the middle of the month the rainfall was heaviest and this was accompanied by strong gales, and local frosts. Towards the end of the month the weather improved, but the last few days gave cloudy unsettled weather with day temperature below the average. April continued unsettled and the month was characterised by excessive precipitation, especially in eastern Scotland and N.E. England. Only S.W. Ireland yielded the normal amount of sunshine. The month began with cool, rainy weather with local snow and sleet in the north. Winds were strong locally and sunshine variable. Minimum temperatures were low. Towards the middle of the month temperatures rose and many districts experienced a warm spell, unusual for the time of the year. The wet weather, however, still continued, and from the middle of the month it became cooler with local thunderstorms. May was unsettled in the north and dry in the south, and the outstanding features were the high temperatures recorded in the middle of the month and the drought in S.E. England during the second half of the month. The first two or three days were mainly fair and dry but this was followed by unsettled weather. Then came a few days of fine, dry, warm weather with high temperatures for the time of the year. By the middle of the month the unsettled weather returned and continued with occasional sleet and hail and ground frosts to the end of the month.

June opened with fair warm weather, though there was cloud and rain in the south. In the north the amount of sunshine was above the average, some stations recording over fifteen hours of sunshine per day. Towards the middle of the month the unsettled weather spread to the north, though temperatures remained high. Towards the end of the month unsettled conditions became general accompanied by cooler weather and local gales and thunder. Rainfall was heavy, causing local floods. Generally, however, the rainfall of the month was below the average. July was marked by excessive sunshine, high temperatures, and deficiency of rainfall. Many sunshine readings were highest on record, whilst several

rainfall readings were lowest on record. Southport registered its warmest month on record. The first half of the month was fine and warm, with very slight local rain and thunder. This was followed by a few days of cooler weather, but the latter half was again warm, though more unsettled than the

WEATHER READINGS OF SELECTED YORKSHIRE STATIONS 1934

(Expressed as Deviations from Normal).

TEMPERATURE (°F.)

	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
Scarborough	+2.1	+3.3	+0.3	+1.5	+3.0	+1.7	+4.3	+1.7	+3.0	+2.3	+1.2	+6.1
York	+2.5	+2.3	-0.4	+0.5	+1.0	+0.7	+4.8	+0.9	+3.1	+2.1	+0.9	+6.6
Hull	+3.2	+2.6	+0.7	+2.8	+2.9	+1.6	+5.4	+2.3	+4.6	+3.2	+1.8	+8.4
Harrogate	+3.2	+3.0	-0.2	+0.3	+1.7	+1.2	+4.7	+0.4	+3.5	+2.5	+0.8	+6.3
Sheffield	+1.9	+1.4	-0.5	+0.3	+2.1	+1.6	+5.4	+0.1	+2.7	+1.8	+0.2	+6.1

RAINFALL (Ins.)

	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
Scarborough	-.74	+ .19	+ .19	+ .83	- .81	- .66	- .64	- .35	- .15	- .84	+ .44	+1.54
York	-.11	+ .17	+ .27	+ .79	- .99	+ .04	-1.0	-1.1	- .20	-1.34	-.41	+2.36
Hull	-.39	+ .15	-.06	+ .37	-1.12	- .84	-1.17	- .40	- .05	-1.42	- .15	+1.1
Harrogate	-.32	-1.79	+ .35	+1.79	- .62	+ .13	-1.52	-1.12	+ .31	- .87	-.42	+3.11
Sheffield	-.08	-2.1	+5.5	+ .54	-1.01	-1.37	- .97	-1.6	- .16	-.72	-.93	+1.39

SUNSHINE (Hours).

	J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.
Scarborough	+11	+49	-20	-29	- 4	+ 8	+ 92	+25	+27	+13	- 2	-14
York	+15	+44	-20	-27	+ 8	+ 1	+ 86	+13	+14	-10	- 2	-17
Hull	+32	+44	- 5	+ 2	+29	+29	+111	+55	+63	+33	+ 7	+ 1
Harrogate	+18	+33	-27	-53	- 3	-25	+ 56	- 8	+11	-27	-20	-29
Sheffield	+ 7	+13	-27	-32	- 1	-10	+ 46	+ 1	+22	+ 1	-18	-22

early part, with occasional rain or drizzle. Thundery weather in the middle of the month caused local floods. Unsettled weather marked the month of August, with heavy rain in Scotland and Ireland. Sunshine was variable and thunderstorms frequent. The first fortnight was unsettled generally with occasional heavy rain and fairly high day temperatures. During the third week the south experienced fine warm weather, though unsettled conditions continued in the north, accompanied by gales and occasional thunderstorms. For two or three days the whole country then enjoyed warm sunny weather,

but the month ended with unsettled conditions, lower temperatures and local ground frosts.

September was unsettled, though unusually sunny. Most areas except the south-east enjoyed rainfall above the average. The south-east still suffered from a local drought. The month opened with unsettled thundery weather and local gales. There were bright periods, though mist and fog was prevalent in the early morning. The middle of the month presented a warm spell with temperatures above the average, but this gave place to unsettled, though sunny, weather for the rest of the month with heavy rain at times except in the south-east. Sunshine was below the average in October, though temperatures remained high for the time of the year. The north received more than the average rainfall, but the south still lacked its share. Unsettled weather with bright intervals and high temperatures marked the beginning of the month, though there were occasional thunderstorms and hailstorms. During the third week temperatures fell considerably and gales were experienced in many areas accompanied with rain, hail and sleet. Snow fell in Scotland. After this there were a few days of mild weather with heavy rain in the north and west, but the month passed out with cold wintry conditions accompanied by snow and sleet in the north. These wintry conditions continued to the first week in November, with severe night frosts and fog in the Midlands. During the second week there was heavy rain in the south, the north only getting moderate falls. For the rest of the month conditions were mainly cloudy or dull with local rain or fog. The month was characterised by wintry conditions during the first half of the month and the general deficiency of local rain and sunshine. December was a most exceptional month. Throughout the month mild, rainy and cloudy conditions were general, with a fair amount of mist and fog. Temperatures were well above normal and the minimum temperatures were particularly high, night frost being scarce. On the other hand, the sunshine values were particularly low, and the rainfall greatly in excess of normal except in the north-west.

The year will be remembered for the lack of water in many areas but curiously enough the total rainfall for the year over the British Isles generally was actually above the average. England and Wales only received ninety-six per cent. of the average, but all other parts of the country had more than the average rainfall. The water shortage was due to the deficiency of 1933. A feature of the rainfall, was its uneven distribution. Only two Februaries since 1870 have been drier than that of 1934, and the rainfall of December has only been exceeded three times since 1870. In many areas the rainfall of December was ten times that of February.

In order to bring out more clearly the main differences of weather in Yorkshire during 1934, the accompanying tables have been prepared. The actual readings of temperature, rain and sunshine are not given. Instead the deviations from the normal are presented. The normals are taken for the period 1881-1915 as set out in the *Book of Normals of Meteorological Elements for the British Isles*, published by the Meteorological Office. The actual figures for 1934 have been kindly supplied by the Meteorological Office.

The writer will be pleased to supply any further information connected with the above.

FIELD NOTES.

Bramblings in the Halifax District.—Previous to January 20th no Bramblefinches (*Fringilla Montifringilla*) had, so far as is known, been observed round Halifax this winter, but on this day G. R. Edwards, F. Murgatroyd and myself, when walking on the outskirts of Judy Wood, near Norwood Green, saw a flock of 150-200. The wood is largely composed of beech trees, and the birds were feeding apparently on the fallen mast which is plentiful hereabouts. As the finches worked at the foot of the trees, rapidly tossing the foliage in all directions, the dead leaves appeared to jump about, producing the curious effect as if heavy rain was falling upon them. I am told that this is the largest flock of Bramblings ever recorded round Halifax. Some half a dozen visits to Sun Wood, near here, during the last few weeks have revealed Tree Creepers (one day two were together on the same tree), and a number of Long-tailed Tits on each occasion. On Sunday, January 20th, fourteen Long-tailed Tits had retired, apparently to roost, in one small hawthorn tree.—VERNON S. CRAPNELL.

Cumberland Homoptera.—Commencing in 1918, I have contributed several notes on Homoptera to *The Naturalist* which cover most of the species at present known from the county. Some not hitherto referred to are as follows. I have taken the var. *vittatus* Fab. of *Philænus spumarius* Linn. at Kelsick, near Wigton, and at Silloth in September. *Idiocerus lituratus* Fall. occurred in numbers on Sallows at Todhills, 26.8.31. *Deltocephalus flori* Fieb., taken at Easton, near Longtown, 25.6.29. It is probably common but overlooked. *D. pascuellus* Fall., Todhills in August. *D. punctum* Fall. a single specimen swept on the sandhills at Silloth, 3.9.25. *Jassus mixtus* Fab., I have only taken this at Orton in October, and Mr. F. H. Day records it from

Kingmoor in *The Naturalist* for 1923. *Limotettix 4-notata* Fab. This, too, I have only met with at Orton—in September. *Cicadula 7-notata* Fall., at Blackford, also uncommon. *C. sex notata* Fall. I have taken this species freely in the Longtown district and at Todhills in June. It is subject to some variation. *Eupteryx notata* Curt. is uncommon, Prior Rigg, 20.8.25. *E. vittatus* Linn., infrequent in the Longtown district in June. *E. concinna* Germ. is local on oak at Orton and Kelsick.—JAS MURRAY, Gretna.

On September 15th last, I captured on the wing by the River Derwent, near Hathersage, an example of the lesser earwig, *Labia minor*, Leach. Though probably widely distributed through Derbyshire, the only actual records I have seen refer to the south of the county. On the moors, also near Hathersage, on October 12th, I took an almost black form of *Gomphocerus maculatus*, Thunb. This grasshopper occurs later in the year than most of our species, the latest date recorded by Lucas being October 26th.—JAMES M. BROWN, Sheffield.

REVIEWS AND BOOK NOTICES.

The Way of a Bee, by **George Rendl**. Translated from the German by Patrick Kirwan. Longmans Green & Co., iv+168 pp., 3/6. This book was first published in 1933, and we reviewed it on page 252, Vol. 1933. It is now reprinted in Longman's excellent "Swan Library" at 3/6. It is undoubtedly the best recent literary work on the Bee, and we heartily welcome this cheap edition.

Edible and Poisonous Fungi. Bulletin 23, Ministry of Agriculture and Fisheries (H.M. Stationery Office), 25 pp., 24 coloured plates, price 3/6 net. This recently-issued bulletin contains descriptions and illustrations of fifteen of the commoner edible fungi and of nine poisonous ones. It is actually the fourth edition of a similar handbook prepared by G. Massee, but it has been modified, revised and most of the coloured plates have been redrawn by Miss E. M. Wakefield, the mycologist at Kew. The species selected are representative and the book may be recommended for identification purposes.

English Names of our Commonest Wild Flowers, by **R. Fisher**. Buncle & Co., Arbroath, 344 pp., price 6/-. Three years ago we noticed in this journal the first volume of Canon Fisher's book on the English names of the commoner wild flowers. That volume included the plants which occur in all of the 112 comital areas in Great Britain. The present volume, completed by Canon Fisher before his death, treats of plants which, though common, have a more restricted distribution. There is an enormous amount of information in this book and a very great deal of interest. It gives a wealth of synonyms for flower names, and where possible the derivation of the name is considered. It will be of great value to field workers, and particularly to those with an interest in folklore and archæology.

YORKSHIRE COLEOPTERA COMMITTEE REPORT FOR 1934

W. J. FORDHAM, M.R.C.S., L.R.C.P., D.P.H.

A DEEP gloom has been cast over the Yorkshire Coleoptera Committee by the untimely death of its Chairman, Mr. M. L. Thompson. No one did more to foster the study of our local Coleoptera than Mr. Thompson, who had been Convener of the Committee since 1924.

The past year has not been a good one for beetles and in order to swell the list of Yorkshire beetles numerous records from previous years have been included in this report.

Little has been published during the year, but attention should be called to Mr. Dibb's record of *Caenopsis fissirostris* Walt. from Adel Moor in *The Naturalist* for 1934, p. 55, and Mr. Thompson's record of *Lesteva fontinalis* Kies. from Askrigg (*The Naturalist*, 1934, p. 157). Both these are new county records.

Beetles were recorded on the occasion of the Union's visit to Semmerwater and at the Entomological Section's meeting at Fountain's Abbey, for an account of which see the pages of *The Naturalist*.

In the following list seven species are recorded as new to the county, numerous species new to V.C. 61, two each to V.Cs. 62 and 64, and four to V.C. 63. The asterisk indicates a new vice-county record. The local frequency or otherwise is given in brackets after the name. The names of the recorders are as follows:—

H.B.—H. Britten (Whitby).

W.J.F.—W. J. Fordham (Barmby Moor).

W.D.H.—W. D. Hincks (Leeds).

T.S.—T. Stainforth (Hull).

G.B.W.—G. B. Walsh (Scarborough).

J.W.—J. Wood (Keighley).

Nebria iberica Ol. (Local). Saltersgate. G.B.W.

Licinus depressus Pk. Six examples in early spring. Eastdale. South Cave. T.S. A rare species recorded from Hull, Flamborough and Halifax (1822).

Trichocellus cognatus Gy. (Locally common on moors N. and W.). Saltersgate. G.B.W.

Laemostenus complanatus Dj. (Rare). Very common in the summer in the waste ground near King George Dock, Hull. T.S.

Calathus erratus Sg. (Local). Saltersgate. G.B.W.

Bembidion nigricorne Gy. (Local, moors N. and W.). Saltersgate. G.B.W.

B. atrocoeruleum S. (Very local). Bloody Beck. G.B.W.

B. rupestre L. (Local and rare). Eston Nab. Robin Hood's Bay. W.J.F.

B. punctulatum Dr. (Rather local). Sinnington. G.B.W.

Aepus marinus Str. (Very local). Gristhorpe Bay. G.B.W.

**Demetrias monostigma* Sm. (Local). Allerthorpe Common. W.J.F. 61.

**Dromius agilis* F. (Very local). Allerthorpe Common. W.J.F. 61.

**D. nigriiventris* Th. (Local). Allerthorpe Common. Fir tops. W.J.F. 61.

Hygrobia hermanni F. One example in pond at Hedon (October, 1934).

T.S. (Very local). Only from Hull, Withernsea and Doncaster.

Calambus 9-lineatus S. Middleton-in-Teesdale. 8-16. G.B.W. Eston Nab, 24/8/11. W.J.F. (New to Yorks.). Scottish type of distribution, but has been recorded from Hampshire.

Deronectes borealis Gy. (Local and rare). Keighley. J.W.

D. sanmarki Sg. ab. *rivalis* Gy. (Local). Helmsley. G.B.W.

- **Agabus paludosus* F. Knottingley, 1898. Skipwith Common. W.J.F. 61.
- **A. uliginosus* L. ab *dispar* Bld. (Very local). Bubwith. Flood refuse. W.J.F. 61.
- A. labiatus* Bm. (Very local). Allerthorpe in line ponds. W.J.F.
- Copelatus ruficollis* Sl. (Local). Silsden. J.W.
- Aleochara intricata* Mn. (New to Yorkshire). Whitby, 9/20. W.J.F.
- A local species found in dung, moss, and haystack refuse.
- **Exaleochara morion* Gr. (Local). Bubwith. Flood refuse. W.J.F. 61.
- Phlaeopora angustiformis* Ba. (Rare). Allerthorpe Common, in birch stump. W.J.F.
- **Calodera riparia* Er. (Very rare). Bubwith. Flood refuse. G.B.W. 61.
- Zyras humeralis* Gr. (Local and rare). Barnscliff. Decidedly rare, with *Formica rufa*. G.B.W. Only previously recorded by Lawson from Scarborough.
- **Atheta æquata* Er. (Rare). Allerthorpe Common, birch stump. W.J.F. 61.
- **A. nigricornis* Th. (Rare). Allerthorpe Common. W.J.F. 61.
- **A. pagana* Er. (Local). Bubwith Ings. W.J.F. 61.
- **A. longiuscula* Gr. (Local). Aughton, mole's nest, W.J.F. 61.
- Coxwood, W.J.F. Fylinghall, W.J.F.
- **A. parva* Sg. var. *muscorum* Br. (Local). Skipwith Common. W.J.F. 61.
- Plagiarthrina terminalis* Gr. Bubwith, flood refuse. G.B.W.
- **Gyrophana gentilis* Er. (Local). Allerthorpe Common, boletus. W.J.F. 61.
- G. nana* Pk. (Rare). Allerthorpe Common, boletus. W.J.F.
- Only previously recorded from Skipwith Common.
- G. lævipennis* Kr. (Rare). Fylinghall, fungi. W.J.F. Only previously recorded from Glaisdale.
- Mycetoporus rufescens* S. (Very local). Skipwith Common, in tufts. W.J.F. 61.
- **Quedius lateralis* Gr. (Local). Bubwith. W.J.F. 61. Robin Hood's Bay, moors. W.J.F.
- **Q. ochripennis* Me. (Rare). Keighley, Silsden, wasps' nests. J.W. 63.
- Q. brevis* Er. (Rare). Barnscliff, two in April. G.B.W.
- Q. fumatus* S. (Local). Helmsley. G.B.W. In late October.
- Q. auricomus* Kw. (Local). Malyan Spout, in dripping vegetation with *Dianous cærulescens* Gy. and *Stenus guynemeri* Dv. G.B.W.
- Staphylinus fuscatus* Gr. (Rare). Leeds. J.W.
- S. erythropterus* L. (Local). Moreby Park, Naburn. H.B.
- Philonthus intermedius* Bl. (Local). Yedingham, flood refuse. G.B.W.
- P. albipes* Gr. (New to Yorks.). Allerthorpe Common, grass tufts, 6/27. W.J.F. Not common in Britain but widely distributed as far north as the Forth and Solway districts.
- **Gabrius splendidulus* Gr. (Rare). Allerthorpe Common, W.J.F. 61. Crathorne. W.J.F. 62.
- **Lathrobium filiforme* Gr. (Rare). Bubwith, flood refuse. G.B.W. 61. Only recorded from Askern.
- **Stenus bipunctatus* Er. (Rare). Bubwith. W.J.F. 61.
- **S. nigritulus* Gy. (Rare). Bubwith. W.J.F. 61.
- Lesteva pubescens* Mn. (Very local). Sandsend. H.B.
- L. punctata* Er. (Local). Sandsend. E. W. Aubrook.
- Micralymma marinum* Str. (Rare). Gristhorpe Bay. G.B.W.
- Omalium oxyacanthæ* Gr. (Rare). Scarborough, cut grass. G.B.W.
- Only recorded from Saltburn.
- **Bythinus bulbifer* Rb. (Local). Bubwith, flood refuse. W.J.F. 61.

- Olibrus pygmaeus* St. (New to Yorks.) Bubwith. W.J.F. Most northerly record, occurs on flowers of *Filago*.
- Epuræa florea* Er. (Very local). Helmsley. G.B.W.
- **Meligethes lumbaris* St. (Local). Allertorpe Common. W.J.F. 61.
- Byturus aestivus* L. (Very local). Not uncommon on flowers at Helmsley. June. G.B.W.
- **Dermestes vulpinus* F. (Local). Bubwith. Brighton. W.J.F. 61.
- **Megatoma undata* L. (Very local). Bubwith. Escrick. W.J.F. 61.
- **Porcinolus murinus* F. (Rare). Allertorpe Common. W.J.F. 61.
- Lathelmis volkmari* Pz. (Local). Common in stream. Helmsley. G.B.W.
- Esolus parallelopedus* Ml. (Local). Helmsley. G.B.W.
- Aphodius fœtens* F. (Local). Askham Bog. J.W.
- Athous longicollis* Ol. (Rare). Staintondale. G.B.W.
- **Sericus brunneus* L. (Rare). Bubwith. W.J.F. 61.
- **Corymbites sjælandicus* Ml. (Very local). In flight. Lastingham. G.B.W. 62.
- **C. impressus* F. (Rare). Shipley Glen. J.W. 63.
- Malachius bipustulatus* L. (Local). On flowers in valley above Helmsley. G.B.W.
- Dasytes ærosus* Kw. (Very local). Uncommon at Langdale End. G.B.W.
- Ptinus sexpunctatus* Pz. (Rare). Dunnington Church in tower. 'There have been a lot of birds' nests and also bees in the tower,' A. Smith. Probably the *Ptinus* came from one or the other of these. Only recorded from Sheffield.
- **Anobium fulvicorne* St. (Rare). Allertorpe Common. W.J.F. 61.
- Xestobium rufovillosum* D.G. (Rare). Dunnington Church; damaging beams. A. Smith.
- Dinoderus minutus* F. (New to Yorks.). Whitby, in house. H.B. This is an introduced species frequent in Bamboo.
- Criocephalus polonicus* Ms. (New to Yorks.). Hull docks. October. E. Bilton. Evidently introduced. This species occurs in the South of England and the New Forest.
- **Tetropium gabrieli* Wse. var. *Crawshayi* Sh. (Rare). Appletreewick. June. P. D. Hartley. 64.
- Leipus nebulosus* L. (Local). Shipley Glen. J.W.
- **Tetrops præusta* L. (Very local). Allertorpe Common. J.W. 61.
- Phytodecta pallida* L. (Local). Helmsley, common on hazels. G.B.W.
- Gastroidea viridula* D.G. (Local). Bubwith Ings, on *Polygonum amphibium*. Also bred from *Rumex* sp. W.J.F.
- Lochmæa cratægi* Fo. (Local). Allertorpe Common. J.W.
- **Galerucella californiensis* L. (Rare). Bubwith Ings. W.J.F. Knottingley. W.J.F. 63.
- G. sagittariæ* Gy. (Very local). Allertorpe Common, on *Polygonum amphibium*. W.J.F.
- G. tenella* L. (Local). By edge of moorland pool, Ravenscar. G.B.W.
- Halitica britteni* Sh. (Local). Saltersgate. G.B.W.
- **Psylliodes chrysocephala* L. (Local). Keighley. J.W. 63. Upgang. H.B.
- Cassida flaveola* Tb. (Local). Adel Dam. J. R. Dibb.
- Oedemera virescens* L. (New to Yorks.). A dozen specimens swept in a small space in a pretty dale near Helmsley in June. G.B.W. A rare species only found hitherto in Norfolk, Herefordshire and Gloucestershire.
- Anthribus variegatus* Gf. (Rare). Keighley. J.W.
- Attelabus nitens* Sp. (Local). Langdale End. G.B.W.
- **Apion desideratum* Sh. (Rare). Bubwith. W.J.F. 61. Robin Hood's Bay. W.J.F. Only recorded from Scarborough.

- A. pallipes* K. (Local). Common on mercury at Helmsley in May. G.B.W.
- **A. æneum* F. (Local). Allerthorpe Common on *Malva sylvestris*. Barmby Moor on hollyhock. W.J.F. 61.
- **Cneorrhinus exaratus* Mm. (Very local). Allerthorpe Common. W.J.F. 61.
- Sitona griseus* F. (Very local). Allerthorpe Common. W.J.F. Type and var. *sutura-alba* Ol.
- Orchestes alni* L. (Rare). Barmby Moor, under elm bark. W.J.F. Only previously recorded from Foggathorpe.
- **Ips laricis* F. (Very local). Leeds, on study desk. W.D.H. Probably introduced. 64.

GEOLOGICAL NOTES

Three of the four monographs appearing in the Palæontographical Society's volume just issued have particular interest to northern readers. Dr. W. J. Arkell's notes on Corallian Lamellibranchia describe specimens in the Hull, Scarborough, and York Museums; Professor S. H. Reynold's work on *Ovibos* describes bones of the Musk Ox in the Leeds Museum, and the same author's monograph on *Alces* describes remains of the Moose (*Alces machlis*), and records antlers, etc., from the Isle of Man, North Tyne, and East Yorkshire, now in the Museums at Leeds, Newcastle, and Hull.

The Proceedings of the Yorkshire Geological Society for 1934 have just been published (pp. 246-323, 15/-). S. Melmore and J. Harrison write on 'The Western Limit of the Final Glaciation in the Vale of York'; W. Pulfrey gives details of 'A Boring 465½ feet in the Millstone Grits near Sheffield'; M. Black writes on 'Sedimentation of the Aalenian Rocks of Yorkshire'; W. S. Bisat, 'The Goniatites of the *Beyrichoceras* Zone in the North of England'; and H. C. Versey gives 'The Bibliography of Yorkshire for 1933.' In this way the lists of works dealing with Yorkshire Geology, which the Society has published dating from so long ago as 1534, are being kept up to date.

Dr. K. C. Dunham publishes part of his thesis for the Ph.D. of Durham in Part 360 of the *Quarterly Journal of the Geological Society of London*. It is entitled 'The Genesis of the North Pennine Ore Deposits.' The area dealt with is bounded on the north by the Tyne Valley, on the west by the Pennines overlooking the Vale of Eden, and on the south the Stainmoor Pass.

Under the heading 'Roman Britain in 1933,' R. G. Collingwood and M. V. Taylor show that there has been particular activity in excavating Roman sites in the northern counties.

Two of the four items appearing in the *Proceedings of the Geologists' Association* (Part 3, Vol. XLV) are of Yorkshire interest. V. Wilson, J. E. Hemingway, and M. Black give a somewhat technical 'Synopsis of the Jurassic Rocks of Yorkshire,' and the same authors give a 'Report of Summer Field Meeting to North-East Yorkshire.' On Plate 21 of this is an illustration of a section described in the *Hull Geological Society's Transactions*, 1898, as a glacial contortion. But now it is apparently 'intimately connected with the channel structure, and is most probably a result of differential compacting of the shales enclosing the resistant sandstone of the washout.'

An excellent portrait of the late Dukinfield H. Scott, the palæobotanist, appears in the *Proceedings of the Linnean Society* just received.

Dr. J. G. D. Clark, the Hon. Secretary of the Fenland Research Committee, contributes 'Recent Researches on the Post-glacial Deposits of the English Fenland' (with map) to the Quaternary Research Number of *The Irish Naturalists' Journal*.

We have before us Volume II, No. 11 of a magazine with the comprehensive title *Sands, Clays, and Minerals*. A *British Magazine devoted to Economic Minerals*. It contains over 100 pages, has sixteen articles contributed and thirty-four illustrations. It is issued by A. L. Curtis, Westmoor Laboratory, P.O. Box 61, Chatteris, price 3/6 post free. The articles deal with such varying subjects as Mineralogical and Chemical History of the Fossils of Cornwall; Economics of the Carboniferous Rocks; Molybdenum; English Oil Wells; Bentonite; Methods of Testing China Clay; Furnishing a Works Laboratory; Limestones; Tungsten Ores; Calorific Value of Coal; Australian Pearl Industry; Refinement of Whiting; Refractory Cements; Old Stone Cross Heads; Concrete; British Sand and Aggregate Deposits, etc.

The Proceedings of the Liverpool Geological Society, Volume XVI, Part III, recently issued, contains the following papers of interest to our readers, as well as others dealing with other areas: 'Notes on the Petrography of a Well Core from Spital, Wirral,' by I. S. Double; 'The Diatomaceous Earth Deposit of Kentmere, Westmorland,' by G. H. Mitchell; and 'The Haweswater Dolerite, Westmorland,' by E. G. Hancox.

Mr. G. Clement Whittick has written on 'Roman Mining in Britain' in *The Transactions of the Newcomen Society*, Volume XII, in which much information from northern counties is included; and in *The Proceedings of the Society of Antiquaries of Scotland*, Volume LXVIII, Mr. Alex O. Curle gives an account of Excavations at Jarlshof, Shetland, on behalf of H.M. Office of Works, in which he describes and figures a series of moulds for casting swords, bronze axes, etc., almost identical in every detail with the collection found on the Yorkshire Wolds, now in the Mortimer Museum, which was described in *The Naturalist* for October, 1930, pages 347-351. The similarities in the workmanship of these Bronze Age moulds is astonishing, as they might almost have been made by the same individual.

A little while ago two water-worn nodules taken from Artley Beck, Cayton, near the Lune, were presented to the Museum at Hull. The specimens were remarkably perfect and had been used as door stops, and were handed to us because someone had stolen a third, the best example! These prove to be specimens of *Tylonautilus nodiferus* (Armstrong), similar to those illustrated and described by J. W. Jackson and J. Pringle in *The Naturalist* for December, 1928. At the request of the Geological Survey, one of the examples has been presented for exhibition among the Millstone Grit fossils in the new Geological Museum at South Kensington.

An idea of the extent of the specialising in the way of geological research can be assumed from the volume of 'Geological Literature added to the Geological Society's Library during the year 1933, compiled by the Library Staff' (price 10s.). It contains over 300 pages of closely printed titles of papers, and these are only of those actually added to the Society's library.

The Dobree Collection of European Noctue which has been in the Museum at Hull for many years, and a catalogue of which (xv. + 156 pp., price 1s.) was issued in 1909, contained a certain number of type specimens. In the interests of students of Entomology, it seems desirable that these should be in the National Collection, and arrangements have been made whereby they are now in the Natural History Museum at South Kensington, which has supplied suitable specimens of the same species, to take their places.

The Ibis for January contains various notes dealing with birds of different parts of the world and six special articles by experts dealing with the birds of East Africa, Burma, Cape Horn, Northern Nigeria, Syria, North-western Abyssinia.

In Memoriam

HENRY J. WILKINSON

1859—1934.

THE year 1934 witnessed the passing of several valued members of the Yorkshire Naturalists' Union, among whom was Henry J. Wilkinson. Born at Ogleforth, December 28th, 1859, his whole life was intimately bound up with the City of York. Educated at the Minster Choir School, he entered the confectionery works of Messrs. Terry, with which he was connected for the rest of his life. He was appointed Secretary in 1895, then Manager, and during the last twenty years was a Director of the Company. He was a man of great courtesy and personal charm, and devoted much thought and care to encouraging the social amenities of his fellows and a fruitful use of their leisure time. At Terry's he did



much to stimulate the bowling and fishing clubs; for the first twenty-one years he was President of the Minster Old Boys' Association; for nearly sixty years was actively associated with the York and District Field Naturalists' Society, being in turn Honorary Secretary (1883-5), Treasurer (1893-4), President (1901, 1909-10 and 1931-1933), and in 1934 was elected Honorary Life President.

Throughout this period he was ever ready to help the young students, all of whom retain happy memories of his practical encouragement.

In 1891 he joined the Yorkshire Philosophical Society, and for many years took a keen interest in the Society's herbarium. He was Honorary Curator of Botany in 1892, Vice-President in 1916. From 1894 onwards he was engaged on a catalogue of the herbarium, and this appeared in

eleven parts of their publications between 1894 and 1916. His later years were spent in incorporating his own collection of flowering plants and ferns with that of the Society. He had an intimate knowledge of the flowering plants of the York district, and on the visit of the British Association to York in 1906, he prepared a valuable list of the ' Phanerogamic Flora and Vascular Cryptogams ' of the district, published in the handbook of that meeting, pp. 275-293.

At meetings of the British Association in York, Leeds and Hull, he rendered valuable assistance, and many will remember his interest and kindly help on those occasions. It is of such men that the Y.N.U. is proud, and his passing leaves behind a long series of pleasant memories. He was buried in the York Cemetery on December 10th, 1934, and a service held in the Church of St. Michaels-le-Belfrey was attended by a large and representative gathering.

We are indebted to Dr. Gayner and members of the York Field Naturalists' Society for many details for this notice.

T. W. W.

THOMAS JACKSON FOGGITT

(1858—1934).

By the death of Mr. T. J. Foggitt, J.P., Yorkshire loses one of its foremost systematic botanists and the Yorkshire Naturalists' Union one of its oldest members.

He was born at Thirsk and educated at Wharfedale College, Boston Spa, entering his father's business of chemist and druggist at Thirsk at the age of fifteen and becoming a partner with his father in 1863, and later with a brother. In 1917 he took over the business of wholesale druggist belonging to his father, which he conducted until his death. His public activities were manifold and of long standing, and he served on more than a dozen local and County Council committees acting as chairman of many. In 1912 he was made a Justice of the Peace for the North Riding and he frequently presided at Thirsk. He was a County Councillor for the Thirsk Division from 1912 to 1931, when he was made an Alderman.

Mr. Foggitt's interest in botany was lifelong. As a boy he went botanising with his father, who was a tireless worker at the North Riding flora. In a recent article in *The Report of the Botanical Society and Exchange Club* he tells of some of his earliest experiences and of his father's energetic co-operation with J. G. Baker in the exploration of the North Riding, and he gives a vivid description of the disastrous fire at Baker's house in 1864, which completely destroyed all Baker's collections together with the ill-fated first edition of *The Flora of North Yorkshire*. The following passage is of interest as showing how his botanical interests were hereditary: ' I was born into a botanical atmosphere. My father, William Foggitt, later F.L.S., came of a long line of dwellers in North Yorkshire, who traced their origin to a certain Italian from the town of Foggia on the Adriatic, who came over to Cleveland in the sixteenth century in connection with the alum industry. Family legend has it that he was excommunicated by the Pope for so doing, and made his forbidden passage concealed in a barrel. Be that as it may, the Foggitts have been hereditary chemists ever since, and therefore, almost inevitably, hereditary botanists. The combination may be traced in my own family for four or five generations at least, and fortunately shows every likelihood of being perpetuated in the future. My father was a man of unusual parts. Of wide and varied learning, he read his Bible both in Greek and Hebrew, and could quote the Latin and English poets at any length. Botany was his absorbing hobby. From earliest youth he made wild-flower collections and notes, and I have in my possession a Natural History diary extending over

many years which I often think, if edited, might well prove a second "Natural History of Selborne," containing as it does not only notes on flowering plants but also on mosses, fungi, birds and insects concerning which his interest and knowledge were almost equally wide and keen.

It is not surprising, therefore, that T. J. Foggitt's interest in botany was stimulated at a very early age. His own lists and collections he began before he was nine years old. But whereas his father's excursions had been largely confined to North Yorkshire, his enthusiasm took him on innumerable journeys to well nigh every corner of the British Isles, and he came to acquire an intimate knowledge of the British flora. There were few British species of flowering plants, even of the rarest, which he had not seen growing wild, and by repeated visits he came to know the flora of Ben Lawers and Snowdon, of the lakes of Killarney and the fens of East Anglia almost as intimately as that of his own North Riding. The large herbarium which he made is left to the British Museum.

Although one of the oldest members of the Yorkshire Naturalists' Union he rarely, if ever, attended its meetings, but he often contributed botanical notes to the circulars for field meetings, and was acting as recorder for North Riding flowering plants at the time of his death. He had an unrivalled knowledge of the flowers of North Yorkshire, and was always ready to devote time and trouble to showing visiting botanists any flowers they wished to see. His circle of botanical friends was wide and many first saw the rarities of Teesdale, Gormire or the Scarborough district under his guidance, and returned with him to Thirsk to enjoy his hospitality. Two years ago he suffered a long and very serious illness from which he never completely recovered. But his enthusiasm for botany was in no way lessened, and during his last summer he made excursions to Scotland (twice), Wales, the Lake District and East Anglia. The present writer was privileged to form one of the party to visit Scotland with him and his wife in May, and it seemed then as if his old strength and energy were indeed returning. But the end came swiftly following a sudden heart attack on 30th October, and he died a few hours later.

He was of a quiet disposition, a kind and unostentatious man with a deep love of nature; incapable of meanness or any remark which could give pain. Personal ambition did not touch him, and he desired nothing at the cost of others. He was kindly and courteous in his dealings with all, regardless of station. The great regard and esteem in which he was held were shown by the large number of people who assembled to pay their last respects to him, and his many friends will regret the passing of one who was truly 'a man of a choice spirit.'

Mr. Foggitt was twice married. He had no children. His first wife died in 1925, and in 1929 he married Miss Gertrude Bacon, daughter of the Rev. John M. Bacon, of Newbury, Berkshire. She was among the first to take a practical interest in aeronautics, and has written on this, on astronomy and other subjects. She was also a keen and able botanist who shared his interests and journeys. To her we extend every sympathy.

W.A.S.

The Entomologist's Record for November contains 'Names, merely Names,' by T. Bainbrigge-Fletcher; 'The Cottian Alps and Turin in June-July, 1933,' by Rev. E. B. Ashby; 'Aberrations of British Geometridæ,' by E. A. Cockayne (including *Epione vespertaria* Fb. ab. *fulva* ab. nov., a recurrent tawny form from Strensall Common); 'Nomenclature—The List,' by H. J. Turner; 'Notes on Coccinellidæ collected in the Barberton district, Eastern Transvaal,' by J. S. Taylor; 'Notes on Collecting' and supplements; 'British Noctuæ,' by H. J. Turner; and 'Butterflies of the Upper Rhone Valley,' by R. Verity.

THE YORKSHIRE NATURALISTS' UNION'S SEVENTY-THIRD ANNUAL REPORT FOR 1934

(Continued from page 48).

BOTANICAL SECTION

(Chris. A. Cheetham) :—This year has brought further losses to our Section. Mr. E. Snelgrove had not often been with us of late years, though he did much work for the Section previously. Mr. J. R. Simpson had also been less with us recently as his occupation had taken him back to Scotland.

The pages of our journal show many signs of Botanical interest. The age of some species of trees at the time of first flowering are referred to by Rev. C. F. Tomlinson and Mr. A. Malins Smith. The President of our Section, Professor J. H. Priestley, describes 'Some Layering Beeches in Leeds.' Mr. E. Hallowell notes some various types of inflorescence that he had found in plants of *Funaria hygrometrica*.

An interesting MS note written about 1814 is mentioned by Mr. Geo. W. Temperley, which shows that *Juncus triglumis* L. was planted on Cronkley as it was presumed to have been in J. G. Baker's 'North Yorkshire.' A note by Mr. T. Sheppard states that the late J. J. Marshall's collection of Mosses and Hepatics has been presented to the Hull Museum. Dr. Pearsall's paper on 'Woodland Destruction' opens out a fresh viewpoint that may help in the Juniper and other botanical problems. Mr. A. Malins Smith's paper on 'The Flowering of the Ash in 1934' suggests many interesting and valuable lines of investigation that our members can follow out in their own particular neighbourhood. Now is the time to mark definite fruiting or non-fruiting trees for future observation.

The flower display this year has been good on the whole though short-lived, but as Mr. and Mrs. Foggitt point out, the orchids have not done well this year. They mention a fact that shows how mild and open the winter was with us. Some members of the Wild Flower Society endeavoured to find a different kind of wild plant in bloom every single day from November 1st, 1933, to March 1st, 1934, and a Yorkshire member, Miss Rob, of Thirsk, succeeded in doing this with a few plants to spare, other North of England members were almost as good, but members in the South, where the winter was more severe, were far from successful. Mr. and Mrs. Foggitt are of opinion that the Daffodils in Farndale and the Gentian in Teesdale were splendid, due in great measure to them being now protected. The warm dry February was probably responsible for the early blooming of the Purple Saxifrage on Penyghent on February 15th, although we did not see flowers of the Celandine until March, whereas last year they were noted in early January. Hutchinsia did not bloom in Chapel-le-dale this year until late March, this was possibly caused by the cold, dry easterly weather which kept the spring flowers back. Mr. A. Wilson, writing from North Wales, says:

'The spring season here was rather cold and the vegetation late; but, owing to the warmth of June and July, summer flowers bloomed at about their usual dates. They were very soon over, owing to the heat and drought. July was the warmest month I have ever recorded. On the 9th the maximum shade temperature reach 88.2°, and the mean maximum shade temperature for the week July 5th to 11th was 84.8°. (At Southport, July, 1934, was the warmest month of any name during the last sixty-three years.)

' August, however had only a moderate temperature and was much cooler than August, 1933 (mean temperature at Ro-wen, 58.3° against 62.8°). The month was also rather rainy.

' The drought here locally was severe in July (we missed the thunderstorms which occurred in the neighbourhood). Probably the drought accounts for the poor crop on the early fruiting Brambles, such as *Rubus dasyphyllus*. On the other hand *R. rusticanus*, which flowers later, benefited by the August rains and is producing a good crop. Higher up the Conway Valley, where the rainfall of July was sufficient, the general crop of blackberries is very good.'

There is a general agreement amongst the many kind replies to my enquiries that the Ash, Holly, Rose, and Beech are outstanding in their show of fruit, but the Elm and Mountain Ash are not good this year.

Among other trees and shrubs the district seems to influence the result, the Hazel hardly ever fruits in some nor does the Sloe in others, this year in the Austwick area the Hazel is full and the Sloe almost barren, whilst Mr. A. Wilson finds it just the reverse in North Wales. Other trees seem to keep up a more regular yearly fruitage and vary little in the reports, such as Elder, Sycamore, Alder, Birch, and Guelder Rose. Mr. A. Malins Smith, with the assistance of members of the Bradford Naturalists', writes :

' FRUITING OF THE YEAR 1934 IN THE SHIPLEY DISTRICT.—The year 1934, generally fine, especially in the early part of the summer, and following on the wonderful summer of 1933 has given an opportunity, which is rarely vouchsafed, of estimating the effect of two successive fine summers on the fruiting of trees. It is obvious that there cannot be good fruit crops without good flowering, and since the blossom buds are usually formed long before the spring awakening, their profusion or the reverse must depend on the weather of the previous summer. The successful pollination of these flowers and their development into perfect fruits depends upon the weather of the current summer, and especially upon the period when the tree is in blossom. If, as has just occurred, we have two fine seasons in succession, the maximum crop should be obtained, always presuming that in every tree sunshine favours both flower formation and fruit development. Certain trees this year have fulfilled these expectations. The general profusion of blossom will long be remembered and outstanding examples of this occurred in the Ash, the Holly, and the Beech in particular. Our orchard fruit trees also, beginning with the Almond, which I have never seen so profuse in flower, and going on to the Plum, Pear, and Apple, made a wonderful show. I do not put the Hawthorn in the first rank in this respect, though it flowered freely. This abundant flowering affected the majority of our trees and shrubs, and I instance a wonderful show of the old-fashioned double-flowered *Kerria japonica*, whose mass of yellow blossoms carpeted the front wall of a farm-house in the neighbourhood, as a sight long to be remembered.

' The abundance and cheapness of orchard fruits in our markets proves that the blossom was in most districts followed by correspondingly good crops of fruit. In this district the few Crab Apples, though profuse in blossom, are poor in crop, and Sloes are scarce also. Of the other trees mentioned the crop of the Ash is to be estimated with due regard to the fact that, as shown in my paper in the October *Naturalist*, almost half the trees are male and therefore barren. It may safely be stated that female and hermaphrodite trees have almost all borne good crops, some being exceptionally heavy, so that it is an outstanding year for Ash fruits. The same is true of the Holly, whose female trees are all now bearing good crops. It is in fact a record year for Holly berries, though the numerous male trees are, of course, barren. The Beech has

not been so successful in its fruiting. It is an outstanding year for Beech, but in this district there are certainly more than half, I should judge about two-thirds, of the trees quite barren, the remainder having heavy crops, though, as is usual here, the majority of the fruits are mere empty husks. I think there is a tendency for the Beech to be functionally unisexual. Certainly here some of the trees remarkable for the immense number of male flowers, had few female flowers, and these have not left fruit. Other trees produced abundant female flowers, and these are the fruit-bearers. These, too, are in two or three definite instances the same trees as have given us the few fruits formed in less favoured years. These three trees, Ash, Holly, and Beech, are very much superior in fruiting in this district to last year's crop, showing the necessity for *two* favourable seasons to realise their maximum fruiting possibilities. The same cannot, however, be said of the Oak. In this district, though opinions differ somewhat, the crop is, in my opinion, lighter in total than last year. I believe quite as many trees bear some acorns, but there are fewer with very heavy crops. This may shed some light on a much-discussed question among fruit-growers as to whether any tree can bear a heavy crop two years in succession. If this is impossible or difficult then the heavy-cropping trees of last year would be likely to have small crops or none this year. There were sufficient Oaks with no crop last year (I estimated 50 per cent. in this district) to leave the possibility of a good general crop this year. Only observations of individual trees can settle this question, and these I have not made. Mr. Malone, however, informs me of an Oak in Lister Park which was barren for several years until last year, when it bore a heavy crop of large acorns. This year it has many fruits, but the majority are only half the size of those borne last year. Soil conditions seem to have something to do with the matter, for in our woods on the thinnest stony soils, the crop has been very poor in both years.

A feature of the local woods is the abundance of Oak seedlings from last year's acorns. I tested the germination of about 300 of these and found it to be 100 per cent. Evidently it has been so in the woods, for the young seedling Oaks are quite extraordinary in their abundance. The Turkey Oaks in Lister Park flowered abundantly, and left a good crop of acorns.

The few Hornbeams of the district have borne good crops. 'It is probable that some plants are not helped to good fruiting by too dry and sunny a year. Both 1933 and 1934 have given a poor or moderate crop on the Sycamore, and this year our few Maples of fruiting age are barren. The Bilberry has been poor in both years. This year the Rowans have had light crops, and as usual in this area there are no hazel nuts. On the other, hand the Cranberry has been remarkably abundant in both flowers and fruits for our area, where usually very few of either are seen. The Lime has fruited much better than usual. Elder has not been outstanding, and Blackberries, though abundant, are rather small. Hips and haws are about an average, and the same may be said of the Guelder Rose.'

Mr. W. E. L. Wattam in his report says : The winter period had a deficient rainfall. There was but little snow and no severe frosty periods. The spring and summer had a rainfall much below the average. The summer has been sunny and exceedingly dry. This is the second successive year which has produced a lengthy drought. The flowering period of our wildings has been well maintained, their full beauty, however, being concentrated within brief periods in consequence of the drought. On the dry soils there is much shrivelling of the foliage of trees.

OAK. I think the best decision is 'Very Good.' My judgment is

based after an examination of a number of the Oak woods in our district, parklands, and moorland cloughs. The trees which are bearing fruit are heavily laden. In many cases there are groups of three to six trees, and then numerous single trees all well fruited, and then hundreds of others without apparently any fruit.

Writing on the Alien flora, Mr. W. B. Haley says : Alien plants seen in the district this year are *Xanthium spinosum*, *Dipsacus fullonum*, *Datura stramonium*, *Sisymbrium austriaca*, *S. pannonicum*, *Coronilla varia*, *Claytonia alsinoides*, and *Convolvulus americana*, this latter seems to be spreading down the river.

SEEDLINGS. Mr. W. E. L. Wattam states : The most prominent have been Elder, Birch, Sycamore, Oak, and Goat Willow.

Referring again to the seeds of *Rosa canina* mentioned in my reports of 1931 and 1933. Between the 18th and 22nd March, 1934, 97 more Seedlings made their appearance, making a total of 112 out of the 200 seeds planted.

Mr. W. P. Winter says : The weather of 1933 seems to have been very suitable for the ripening of fruits and seeds and the maturing of the trees. This is manifested in the unusually large number of Beech seedlings in the early part of this year. Oak has produced an extraordinary number of healthy seedlings, and these, with their acorns just becoming used up, occur in very large numbers. Birch again shows immense numbers of the first-year trees, and in my experience these are abnormally plentiful. Hawthorn has fruited abundantly. Robinia has flowered more freely than usual.

Mr. J. Meikle Brown adds : The remarkable crop of Spanish Chestnuts which ripened last autumn in the Ecclesall Wood, Sheffield, and which produced such a striking effect on the trees there, has had its effect this year in the large number of seedling trees which have sprung up, a feature which I do not remember having noted in this wood previously.

Coming to the question of secondary growth, Miss Hilary says that she and Dr. Wray have seen little this year except in Copper Beech, which was very noticeable in July. Mr. Haley saw very little. Mr. Wilson observed very little, but thought it due to the July drought. Mr. and Mrs. Foggitt were struck with the very late secondary growth of the Oak. My own view fits in with these, for the first I saw was in the Copper Beches, where it was very noticeable owing to the colour contrast, then the Beech was seen to be showing a fair amount, and in mid-July and August the Oak trees in Harewood Avenue were covered with new leaves, and gave the impression that spring had just come. Wherever I saw Oak trees I saw this kind of thing about this time.

One noticeable feature this year was the very early crop of Mushrooms which were being gathered before Whitsuntide, enquiries showed that this was seen in the South of England as well as with us in the North. The effect on the autumn crop was not evident, for they were abundant then and have lasted for a long time.

Flowering Plants (Dr. W. A. Sledge) : During the past season several good records have come to hand and I have to thank correspondents who have forwarded notes and records, and particularly Mr. and Mrs. T. J. Foggitt, who have submitted a valuable list of their Yorkshire gatherings during the past year. At the same time I would suggest that this annual report would gain in value if more workers at the flowering plants throughout the country would forward their records to me.

The Union's excursions have not yielded many notable discoveries, the best record being *Juncus tenuis*, found at Newton near Fairburn, and already recorded in the pages of *The Naturalist*. It is interesting to note

that *Andromeda* still persists in the Goole area. In June during a meeting of the British Botanical Society and Exchange Club in Teesdale, *Rosa spinosissima* var. *rosea* was found on the Yorkshire side of the Tees, its first record for the county. During the same meeting *Myosotis alpestris*, *Epilobium alpinum*, and a single-flowered form or variety of *Cardamine pratensis*, probably the var. *uniflora* Sturm. and Hoppe. were noted on Mickel Fell. A few days later at Ribbleshead I collected *Carex lepidocarpa*. A further investigation was made of the Marsh Orchids of the Austwick district in company with Mr. P. M. Hall. The results will form the subject of a separate communication, but it may be noted here that a colony of plants identical with '*Orchis latifolia*' (i.e. with the plant recently renamed *O. pardalina* by Mr. Pugsley) was seen at Eldroth. Earlier in the year at Boston Spa I collected *Viola calcarea*, this being its third station in V.C. 64.

From the North Riding Mr. and Mrs. Foggitt record *Carex Boeninghausenia* found in company with Mr. Pugsley at Castle Howard, an addition to the Yorkshire flora. *Carduus eriophorus* was found in a new locality near Rievaux, and they report that *C. acaulis* still persists near by in its most northern-known locality in Britain. *Butomus*, *Utricularia vulgaris*, *Sagittaria*, *Polygonum minus*, and *P. mite* were seen again when Newby Carr, near Thirsk, was revisited, having happily survived the drainage which has destroyed the marsh vegetation of so many carrs in the neighbourhood. They also record *Vicia cracca* var. *incana* and *Picris echioides* from near Thirsk, and *Hypochaeris glabra* from Pilmoor. Special attention has been paid to the Brambles and they record *Rubus mucronatus*, *R. newbouldii*, and a curious form between *R. balfourianus* and *R. corylifolius*, which is mentioned by J. G. Baker in his 'Flora of North Yorkshire,' from near Thirsk. *R. rhamnifolius*, *R. lindleyanus*, and *R. hystrix* were seen at Askham Bog, and *R. rogersii* on Cross Cliff Moors near Scarborough. Mr. J. B. Foggitt reports (per T.J.F.) that he saw over thirty plants of *Malaxis* in a bog near Dent during August.

Miss C. M. Rob records *Arenaria tenuifolia* from Knaresborough. *Rumex maritimus* from Dalton, *Camelina sativa* from Catton near Thirsk, and *Poa procumbens* from Robin Hood's Bay, together with the following aliens from Tanfield Mill :—*Alyssum incanum*, *Coronilla varia*, *Dracopcephalum parviflorum*, *Saponaria vaccaria*, *Potentilla norvegica*, and *Delphinium ajacis*.

Mr. T. Franklin records *Stachys ambigua*, *Melilotus alba*, and *Calamagrostis epigeios* from Ledston, and *Rumex alpinus* from between Yeadon and Otley Chevin.

Mr. R. D'O. Good records *Crepis biennis* from Kilnsey Warren, E. Yorks., and Mr. W. G. Keyworth has sent me specimens of *Bartsia viscosa* from the edge of an artificial pond in Harewood Park, where it is no doubt adventive but an interesting and unexpected record.

Ecological Committee (Miss D. Hilary) : Two meetings have been held during the year. First, during the Annual Meeting of the Union at Leeds on December 10th the Committee met for discussion. As an outcome of that meeting it was decided to hold a Field Meeting at Austwick during the Easter week-end for a longer investigation of Juniper on Moughton Fell than could be carried out in a single day. It was also felt that the whole area should be examined and not only the part where the plots had been staked out. This Field Meeting was a very successful one. Under the leadership of Mr. Cheetham all the Juniper communities—healthy, dying, and dead—were visited. The seven staked-out plots were re-examined, and a very careful search made for seedlings, the few that were found being several years old. A large number of fruits were collected, and a new plot of bare soil was sown with these.

We were fortunate in having with us both the President of the Union and Dr. Pearsall. Mr. Mason made a careful examination of the mycological aspects of the problem. Particularly fine specimens of *Gymnosporangium* were collected and attention drawn to a leaf-spot fungus which was very common and which Mr. Mason thought might be responsible for the death of twigs, if not of whole bushes. Dr. Pearsall drew attention to the very marked bronzed appearance of many of the bushes which might be an indication of the lack of nitrogen. Dr. Wray collected a large number of fruits in order to do experiments on the effect of a prolonged rest period on the germination of the seed. The President of the Committee spent several weeks at Austwick during August, visiting the Juniper several times, and discovered two seedlings in the bared plot. These are almost the only first-year seedlings which have been discovered, although search has been made for several years. An article giving some of the results of the investigations of the committee at Easter is being prepared by Mr. Malins Smith and will shortly appear in *The Naturalist*.

Mr. Mason sends the following notes on the ecology of the Fungi :—

(F. A. Mason) : The spring months of the year were marked by an unusual abundance of the larger Discomycetous fungi. In April, May, and June, *Morchella esculenta* (L.) Pers. was fairly common throughout the county, as was also *Gyromitra gigas* (Krombh.) Cke.

At the Askrigg Meeting, May, 1934, *Disciotis venosa* (Pers.) Boud. also occurred in particularly well-developed colonies; Morels on that occasion were plentiful, and their development in a well-marked ring on a grassy hillock behind the station was observed.

Mr. A. E. Peck has also referred to the occurrence of Morels in the Forge Valley, and he records the re-appearance of the rare Discomycete *Verpa digitaliformis* Pers. in the same locality, *The Naturalist*, p. 199, 1934.

Among the Agarics the St. George's Mushroom was not so plentiful as usual so far as my own observations and correspondence are concerned, while the Common Mushroom has been more plentiful than for many years past, and there were good crops reported as early as May this year.

The question relating to the disappearance of the Juniper as studied and discussed at Austwick during Easter week-end, March 31st to April 2nd, was found to have considerable mycological interest. A great number of bushes on Moughton, and a few at Feizor and Oxenber, were seen to be badly attacked by *Gymnosporangium clavariæforme* Dc., which produces the well-known malformation of the branches and twigs. Little evidence could be found of damage that leads to the destruction of the Juniper, and the growth above the malformations has quite as healthy an appearance as that of bushes not attacked by this fungus.

I have prepared a set of photographs illustrating the aecidial and teleutospore stages of the fungus as records for deposit in the Museum of the Botanical Department of the University.

A much more likely factor in the destruction of the Juniper is severe attack by the microscopic fungus, *Lophodermium juniperinum* DeNot. This species causes widespread destruction of the leaves of the Juniper, which is also well illustrated by the photographs.

Mr. Wattam sends the following results of his experiments on the germination of Juniper seeds and notes on the ecology of lichens.

(W. E. L. Wattam) : With a view to testing the fertility of the fruits, and also obtaining data as to germination of seedlings, I collected 120 fruits at Moughton on the 23rd September, 1933. These fruits have been dealt with as follows :—

1. Twelve fruits planted in a sandy soil obtained from beneath the

large Juniper trees south of test plot 3. The plant-pot containing these fruits has been in a heated greenhouse since the 28th October, 1933, but there have been no signs of any germination.

2. Twelve fruits planted in a sandy-clay soil obtained near to the partially bared test plot. Treatment as No. 1, with same results.

3. Forty fruits were dissected, each averaging three sound-looking seeds. Thirty-six of these seeds were planted on the 12th May, 1934, in ordinary sandy loam, but no signs of germination have appeared.

4. Eighty fruits were planted in the garden (ordinary soil) on the 12th May, 1934, but no seedling plants, or signs of germination have been apparent.

As stated in note 3, the average number of sound-looking seeds found in each dissected fruit was three, and also one rudimentary seed.

Lichens (W. E. L. Wattam): During the Union's excursion to Askrigg in May, 1934, the almost entire absence of fruticose species in the woodland belts at the Marsett end of Semerwater, and Mill Ghyll, and Whitfield Ghyll was most noticeable. The sole representatives were *Evernia prunastri* Ach. and *E. furfuracea* Mann. The conditions were ideal, as was evidenced by the rampant growth of foliose species as mentioned in my report appearing in *The Naturalist* for July, p. 162.

The excursion to Fairburn on the 16th June, 1934, gave the opportunity of noting species on a calcareous substratum which evidently are able, like more cosmopolitan species, to withstand the smoke conditions of the surround of colliery coke ovens. Both foliose and fruticose species were absent on the more aged trees in Byram Park, Ferrybridge. See my report appearing in *The Naturalist* for September, pp. 211-212.

Bryological Section (Mr. F. E. Milsom) writes: It is with deep regret that we have to record the death during the year of Mr. J. R. Simpson. Although latterly not resident in Yorkshire, he was known to all as a keen bryologist, and in his years of residence in the county did some fine work, of which the most outstanding example was his ecological survey of the mosses of Hagg Wood (*The Naturalist*, 1921, pp. 241-244). He also made some valuable contributions to our knowledge of the distribution of *Orthodontium gracile* in the county.

Members of the Bryological Section attended the meetings at Farndale, Askrigg, and Fairburn, of which particulars will be found in *The Naturalist*. The most outstanding event of the year, however, was the visit of the British Bryological Society to Ingleton in August. A very successful week was spent in the district, with ideal weather for bryology, and several new records were noted. It is hoped to issue in the near future a separate and full account of the meeting with lists of all species gathered.

It has not been a particularly noteworthy year as far as hepatics are concerned, but the following are new records of mosses:—

Ceratodon conicus Lindb. (V.C. 64).

Campylopus subulatus Schp. (V.C. 64).

Philonotis caespitosa Wils. (V.C. 64).

Webera calcarea Warnst. (V.C. 64).

Bryum argenteum L. var. *lanatum* B. and S. (V.C. 64).

Eurynchium praelongum Hobk. var. *Stokesii* Brid. (V.C. 65).

In addition to the above, another station has been discovered in V.C. 64 for *Tortula cernua*.

The two abnormally dry summers in succession have had their effect on the moisture-loving hepatics. For example, on Helwith Moss, in spots where *Cephalozia loitlesbergeri* has been usually plentiful, it was only possible this summer to find a very small amount. It will prove interesting to trace the recovery of this species, assuming the drought does not continue.

In conclusion, it may be emphasised that more systematic bryologists are wanted in the county.

Mycological Committee (Dr. J. Grainger) : The Annual Foray was held at Ingleton, from September 15th to 21st. Dry conditions had prevailed before the meeting and early collections were somewhat scanty, though several heavy falls of rain relieved the situation. At the General Meeting of the Committee, Miss D. Hilary, B.Sc., was elected Chairman for the coming year. Arrangements for a closer link with the educational population of the place of meeting were discussed, and school masters, with selected scholars, are to be invited to view the collections and attend popular lectures on fungi. The meeting was enriched by the exhibition of Mr. Mason's extensive collection of mycological photographs. Mr. T. Petch, B.A., B.Sc., Chairman for the present year, spoke on 'Mycology at the Tropics,' and later delivered a most valuable talk on British species of the genus *Claviceps* (ergot-producing fungi). This is a part of Mr. Petch's more extensive study into the classification of the Hypocreaceae, a section of the Ascomycetes. Results of this investigation are communicated to the Committee from time to time, and provide an exceptional opportunity for students and teachers of Mycology. More detailed accounts of the Committee's transactions appear in *The Naturalist*.

GEOLOGICAL SECTION.

(Dr. Versey) : Among the season's excursions, that to Farndale proved of greatest interest to the geologists, in that new ground was investigated. Examination of the sections in the deserted Blakey Ironstone mines enabled a comparison to be made between the Dogger in Farndale and that exposed in the adjacent valleys of Rosedale and Fryupdale. The usual varieties of the ironstone were found, but a black rock which resembled the Rosedale magnetic ore proved on subsequent laboratory examination to be only feebly magnetic. In sections north of the mines, the ironstone proved to be thinner, but lower strata were seen of a greenish shaly character resembling beds exposed at apparently level in Fryupdale. No fossils were found. A fuller account of these rocks in their relation to the rest of Cleveland will appear later.

Geological Photographs Committee.—The convenor has continued to carry out his work in photographing geological sections in East Yorkshire with special reference to those sections likely to be only temporary. The need of similar effort in the remaining parts is again urged. The albums of the Union are being maintained in good order.

Glacial Committee.—The publication by Dr. Raistrick of his paper on the Correlation of Glacial Retreat Stages in the North of England has served to bring to a focus a large amount of information collected by himself and other geologists and has provided a criterion for determining the chronological relations of glacial events in different parts of the county.

Temporary Sections and Borings Committee.—The convener regrets that insufficient interest is taken in the important work which this committee might do. Any section exposed in temporary excavations may be of scientific value but unless steps are taken to record it, all its value may be lost. All members of the Union, not merely geologists, are asked to co-operate in this work and to notify the convener or some other member of the committee of any new section which comes to their notice.

NEWS FROM THE MAGAZINES.

In the *Transactions* of the Cumberland and Westmorland Antiquarian and Archaeological Society recently issued, Lt.-Col. Oliver H. North, has a note on 'Some Recent Local Finds of Stone Implements;' in this he says: 'The Axe head with groove round it was found at Biglands, by Samuel Redman. It is 4 ins. broad and 6 ins. long and weighs 2 lbs. 15 ozs. It was found in a ploughed field and showed plough marks on it. It is undoubtedly of South American origin. I have since been told that a former resident at the place at which it was found had lived in South America, and had collected various native implements, so it had evidently come from his collection and had been lost or thrown away. I was surprised to see another of similar form in the Tullie House Collection at Carlisle. Mr. Gray kindly gave me the following information about it—"The hand axe 4 ins. broad ploughed up at Eden Hall, obtained by us from the Robert Ferguson Collection, is marked by the late Professor Boyd Dawkins as being Mexican." These two instances of undoubtedly genuine finds show how careful one has to be. In my collection, I have four arrow heads found in a building house on the Folkestone Road, Dover, which are North American, probably from Ohio.'

In East Yorkshire quite a number of similar instances have occurred. In a collection bought at Hunmanby some time ago, was a specimen which I was assured had been found in the fields; it was evidently a New Zealand axe and I later found out that a former clergyman there had been in New Zealand. Similarly, a magnificent 'mammoth' tooth which was said to have been found on the Yorkshire Coast, for years adorned a rockery at Ottringham, East Yorkshire. Eventually it reached the Hull Museum and proved to be an enormous tooth of a modern Indian elephant. I found that a former occupier of the house had lived in India.—T.S.

The *Entomologist* for January contains 'Lepidoptera in a Hertfordshire Wood,' by H. King; 'Migration Records,' by Capt. T. Dannreuther (*Colias croceus* Fourc. from Alston, Cumberland (1,000 ft.), and a doubtful report from Carlisle. *Acherontia atropos* L. from Wharfedale and Durham. *Macroglossa stellatarum* L.—about 300 recorded—Bamburgh, Spurn Head, Whitby, Isle of Man, and larvæ common in Lancashire are among the records. *Plusia gamma* L., July 7th, free occurrence on the Durham coast. *Aglais urticae* L., 31 miles off the Spurn. *Danaus plexippus* L. captured at Bolton Abbey, October 2nd); 'A cynipid *Timaspis sonchi* Stefani as British,' by R. S. Bagnall and H. J. Burkill (in the Birmingham and another Midland district, Coulsdon, Surrey and Epsom Downs); 'A Catalogue of the Noctuæ of Ireland,' by Lt.-Col. C. Donovan; 'A New *Paralasa* (Lep. Satyridæ) from Tibet,' by Lt.-Col. F. M. Bailey; and numerous Notes and Observations.

The *Entomologist's Monthly Magazine* for December contains 'Notes on Wasps, III,' by G. E. J. Nixon; 'Notes on the Passalidæ (Coleoptera),' by W. D. Hincks; 'Notes on British Collembola,' by R. S. Bagnall (the genus *Anuridella* Willem—*A. marina* from Essex, E. Yorks., Northumberland and Durham, and Scotland, *A. calcarata* from Torquay and North Wales, and *A. submarina* sp. nov. from Durham) and several short notes including 'Hymenoptera Aculeata from Braunton Burrows,' by G. M. Spooner (numerous interesting species, including *Tachysphex unicolor*, *Psen unicolor*, and *Psammochares infuscatus* new to Devon).

The *Entomologist's Monthly Magazine* for January contains 'Odonata and other Neuroptera (sens. Linn.) in Ross,' by K. L. Morton; 'Systematic Notes upon British Aquatic Coleoptera,' by F. Balfour Browne (*Agabus* and *Platambus*); 'A New Generic Name in the Protoneuridæ (Odonata),' by J. Cowley; 'A Stable Nomenclature?' by G. V. Hudson; 'The British Fungicolous Coleoptera,' by H. Donisthorpe (117 species enumerated with precise records of the fungi from which taken); and a few short notes.

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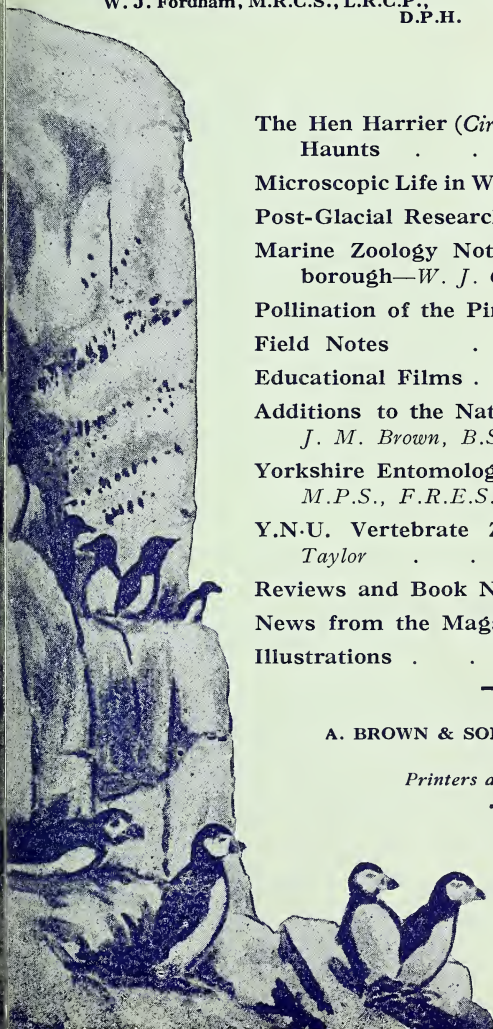
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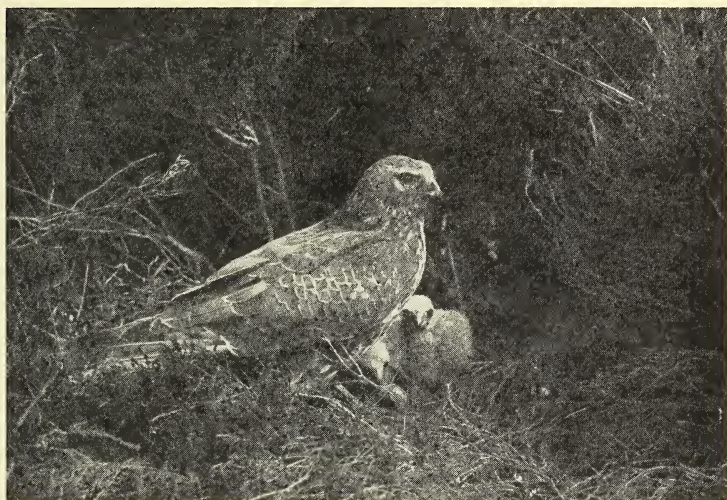
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THE HEN HARRIER (*CIRCUS C. CYANEUS*) IN ITS BREEDING HAUNTS

(Report of Paper read by Ralph Chislett before the Vertebrate Section of the Yorkshire Naturalists' Union).

THE harriers form a group of large hawks. Their most noticeable distinguishing features are their slender frames and long thin legs, and a very noticeable facial disc, somewhat less developed than in the owls.

The largest in Britain is the marsh harrier, and the smallest the Montagu's. The hen harrier approaches the marsh harrier



Copyright]

Female Hen Harrier at Nest.

[Ralph Chislett

in size, but in plumage more resembles the Montagu's. In both hen harrier and Montagu's harrier the well-developed male has slate grey, sometimes almost white, wings and back plumage, with dark wing tips; in the case of Montagu's harrier broken by black bars on the secondaries. The hen harrier's conspicuous white root to the tail is a good guide to identification in the air.

In *The Birds of Yorkshire*, Thomas Allis is quoted as saying in 1844 that the hen harrier was 'not uncommon in the low grounds and carrs near Doncaster—still breeds on Hambleton and in the neighbourhood of Pickering, and is not infrequently seen scouring the hedgerows in the vicinity of Huddersfield.' In 1888 eggs were taken in Dentsdale. Prior

to these dates there is no doubt the species bred extensively on our Yorkshire moors and heaths. Over most of Britain a similar state of affairs existed. In Scotland the dates are later. Harvie-Brown wrote in 1904 that the species 'may be almost said to have approached extinction on the mainland within the last ten years.' One Scottish keeper killed thirty-two hen harriers in 1870, and another one killed twenty-five in 1873. Small wonder can be expressed that for years now to see the species in its breeding haunts it has been necessary to visit the Outer Hebrides or the Orkneys. That game preservation is the cause of the species disappearance there is no doubt. The lecturer caused amusement (with game-preservers present) by referring to the gamekeeper's object as 'to minister to the gratification of a palæolithic instinct which in really civilised people has died out.' 'Interesting and natural life is destroyed,' he said, 'so that uninteresting and unnatural life may be reared, for the purpose of enabling human throwbacks to enjoy being throwbacks, to enjoy the kind of savagery which to the ancestors they throwback to was a necessity of life.'

Unsuccessful attempts, made a dozen years ago, to study the hen harrier from close quarters, added to its reputation for shyness, and Mr. Chislett had felt compelled to wait until he could give a long holiday up to the species before making his attempt. He and his colleague, Mr. T. M. Fowler, also waited until their birds had young in the nest before disturbing them with 'hides.' 'No one ever again ought to try to get to close quarters with a hen harrier until her eggs have hatched.' A tribute was paid to the work of Orcadian ornithologists who now give protection to the hen harriers and keep watch over their nests.

After describing the agricultural and archæological features of Orkney, and referring to the plenitude of the ordinary moorland birds (snipe, redshank, curlew, lapwing, golden plover, dunlin, merlin, etc.), the lecturer showed a few slides of black guillemots, and of the twite, and mentioned the Orkney vole, the presence of which probably accounted for the breeding of short-eared owls, and for the residence throughout the year of hen harriers. Orkney opinion, however, is that some of the harriers migrate.

From the sea backwards to the lower slopes of the hills, Orkney is cultivated. The hills are peat covered and heathery. Little is seen of the harrier as one crosses them. Here and there on the hillsides patches of heather are mingled with rushes, growing on wet places. Such are typical nesting sites for hen harriers. Several nests were seen. Sometimes rushes formed the background to the nest, occasionally heather

Entomological Congress, Oxford, 1935.

THE SOCIETY FOR BRITISH ENTOMOLOGY announce that they are inaugurating a series of BRITISH ENTOMOLOGICAL CONGRESSES to be held in a different Centre each year, and that they have accepted an invitation from the ASHMOLEAN NATURAL HISTORY SOCIETY OF OXFORDSHIRE to hold the 1935 Congress in the City of OXFORD. The dates selected are from the evening of the 12th to the 15th July, 1935, and a cordial invitation to attend the Congress is extended to all persons of either sex who are interested in any aspect of British Entomology.

Professor G. D. Hale Carpenter, M.B.E., D.M., F.L.S., F.R.E.S., Hope Professor of Zoology (Entomology) in the University of Oxford, President of the Society for 1935, will preside, and the proceedings will consist of an Opening Session; Presidential Address; reading of Papers; inspection of Exhibits; visits to the University Museum, School of Forestry, and School of Rural Economy; a *Conversazione*; a Dinner and two Luncheons in College Halls; a Field Meeting; an *al fresco* Tea; and perhaps other items.

Visitors are invited to bring Exhibits, for the display of which facilities will be provided in the Hope Department of the University Museum; it is suggested that exhibits might be selected to illustrate work which the exhibitor has in hand.

Any person having a matter of importance which they wish to bring before the Congress should let the Hon. Secretary have particulars at the earliest possible moment. The Council will endeavour to provide an opportunity for this to be done, and if desired for a Resolution on such matter to be voted upon.

Accommodation in College buildings (for both sexes, but separately) will be available at very low rates, and special cheap return tickets will be obtainable from all Railway Stations to Oxford. The cost of attending the Congress need only therefore be small.

A detailed Programme with full particulars and directions will be available shortly, and **a copy will be sent to any name and address on receipt of a postcard.** The Hon. Secretary will be pleased to answer enquiries, and to render every possible assistance.

The Council hope that every British Entomologist who can do so will attend the Congress so that it may be thoroughly representative.

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with rushes beyond it. A sitting harrier would allow human beings to pass at twenty yards. Four to six eggs are laid, hatching with one or two days' interval between, so that the young were graduated.

As with harriers generally, hunting for food was mainly done by the male. The female remained on a vantage point on the hill above the nest, keeping guard. She seldom attacked anything, but when a short-eared owl came by would spring into the air and sail about keeping herself between the owl and her own nest. Plovers, curlews, etc., often swooped at the harriers as they passed over the swooper's territory. Food consisted of young wading birds (plover, curlew, lap-wing, etc.) and voles, with an occasional blackbird or starling. When hunting, the harriers sail, wings held at an angle, giving only occasional beats. The head is lowered to scan the ground. It is doubtful if they can turn quickly enough to catch swiftly flying and turning birds on the wing. It follows that in winter, when no young birds crouch on the ground, the food must be mainly vole. In the breeding season, although differing each day, food brought to the young was approximately in the proportions of two-thirds young (mainly wading) bird, and one-third vole.

The alarm note at the nest was a weak chitter. To let the male know food was required the female squealed at him in the same tone as the cry which the young gave when hungry on sight of their parent. When the cock came with food his call was a guttural grunt like 'eremp' or 'erump.' The hen usually saw him coming and flew to meet him. Aerial evolutions round each other would often end with the pair flying in the same direction, she below, he above. Sometimes they appeared to meet for the transference of food. At other times the cock dropped his prey for the hen to catch; sometimes the hen turned sideways and apparently used both feet; at other times when the food was dropped before her she grabbed it with one foot as it came past her. Then the cock often flew over the nest and disappeared beyond, whilst the hen went to a vantage point on the hill to dress the prey.

On arrival at the nest, the hen usually stood on the prey motionlessly for a time—once for some ten minutes, as she watched the lens and listened for sounds. If the photographer clicked his shutter during the scrutiny the bird would depart with a chitter of alarm, and she would remember it all day, demonstrating at the lens and even clawing it and dislodging some of the moss which was wrapped and tied round it for camouflage. The best advice Mr. Chislett could give to would-be photographers of the hen harrier who have overcome

the preliminary difficulties was to hold their 'fire' until the bird's scrutiny had ended and it had begun to attack the prey. Then slight sounds were not heeded, even if heard. Nothing remained after a meal, titbits were given to the young, drumsticks were swallowed by the old bird, any uneatable remains were usually taken away. Some blackbird's primaries and a partially eaten young golden plover were the only remains seen in the course of many visits to four nests, and on these occasions the old birds left the nest on being disturbed before the meals were completed. When coming to the nest without food, *e.g.* to brood, the female often brought with her a twig of heather or a little bunch of two or three bits of rush stem.

Two nests were watched until the young were some five weeks old, when they were well grown, had lost much of their light-grey down, and would vigorously flap their wings to help the remaining down to be shed, and, no doubt, for exercise. At this stage they would wander yards away, returning with their parents' approach. During a rainstorm an old harrier managed to spread her wings over four out of five month-old chicks, all of which were approaching to her own size.

An interesting incident related to a short-eared owl which was seen to be carrying a vole, and which was protesting against the swoops of some gulls. When a female harrier joined in the attack on the owl, it dropped the vole for the harrier to 'field' and serve up as food for her own young.

When four out of five young harriers had left the nest and were being fed a hundred yards higher up the hill, the old harrier floated down the hill and alighted on the roof of the hide. After watching her youngest for a moment, she leaned forward and floated off the hide, then curved round and up the hill again. The 'youngest' raised his wings, sprang into the air, then circled round the hide and followed his parent.

The set of some forty lantern slides which illustrated the paper covered most of the incidents described, including many feeding incidents with three families, and both male and female birds in the air, the latter carrying food in her foot. Slides showing a female harrier swooping at the head of Mrs. Chislett, and hitting it more than once, concluded a very remarkable series of photographs. Members of the Vertebrate Section have learnt to expect a very high standard of technique in Mr. Chislett's work, and this together with the interest and rarity of the species described, contributed to a very notable paper.

MICROSCOPIC LIFE IN WINTER

ERNEST GRAY, M.R.C.V.S.

IN the January issue of *The Naturalist* I note that Mr. Schroeder in his freshwater microscopist's diary remarks that although winter is not usually considered a good season, infusoria can still be found even beneath ice. Now this interested me. I have been an enthusiastic 'pond-hunter' for some years now, and I have always found infusorial life richest in variety and colour in winter: I am speaking especially of the Protozoa and Algæ. A year ago, when I was at my Yorkshire home for Christmas, we had a heavy frost. But, to quote my notebook, December 6th, 1933, 'Found life in abundance in water weeds taken from beneath ice 1 in. thick. (I measured its thickness carefully.) Among them was a very pretty little Water Bear, the ubiquitous *Vorticella*, several *Paramecia*, *Ciliates* (unknown), the Swan *Animalcule*, *Urocentrum turbo*, diatoms (especially *Gomphonema geminatum*), desmids, Euglenids (all of a very bright green colour), *Hydrodictyon* the Water Net, and two varieties of *Stentor* (*polymorphus* and *niger*). I have found the same thing wherever I have hunted. I would like to stress one point. I say nothing as to the *quantity* of life; what has always struck me is its *variety* and *richness of colour*. The same holds good for the infinitely more complex Infusorians, the Rotifera. These also I have found commoner in winter, even the delicate Sersile forms. I found my first Floscule in a moorland pool on the twentieth of November, when the countryside was shrouded with snow. I had been taking samples from that particular pool for some years, but had never before found any Floscules, or, indeed, any Sersile Rotifers, in it, despite a most diligent search of likely spots. It is significant that the sheath of this particular specimen contained a thick shelled egg. Later I found *Melicuta* in the same pool, but also in the winter months. It is interesting in this connection to quote Badcock's *Vignettes of Invisible Life*. He remarks that he has found *Conochilus volvox*, one of the colonial Rotifers, best in winter; he says that 'The winter is the best season for getting the creatures (*Conochilus volvox*) in their prime. I have always found them in best condition and in greatest abundance when the ice had to be broken to fish them up.'

The reason for this variety and colour is obscure. It would seem, indeed, that it rests, not upon one factor, but on several. The bright green colour of the algæ, indicating as it does a full metabolic activity, gives us one hint. Kathleen Carpenter, in her *Life in Inland Waters*, states that the primitive plant life of a freshwater pool or stream ebbs and flows

as certain salts—especially nitrates—are present or absent in the water. And the activity of this microscopic winter fauna in breaking up the dead bodies of summer's departed hosts undoubtedly releases a large quantity of nitrogenous matter into the water. An alternative factor may be the absence of the higher animal forms which prey on these infusoria, coupled with the high oxygen content of the water, these two things releasing the Protozoan life to a wider range of activity.

But these are controversial matters, and more evidence must be available before we can call any one factor the decisive element. The facts as to the variety of infusorial life remain, and I hope may be of interest.

POST-GLACIAL RESEARCH

W. H. P.

Two publications of especial interest to workers on peat deposits have recently appeared. In the *New Phytologist* (33, 278-305 and 325-358) Dr. H. Godwin has a detailed review dealing with the technique of pollen analysis, with the principles involved, and giving a full and lucid summary of the main findings obtained from this method and their relation to the archæology and climate of the post-glacial period in North-west Europe. In maps summarising existing records for the British Isles, he shows that the earlier British peats show the presence of a widespread transition from a phase when pine and birch pollen was abundant to one in which alder pollen was abundant. He tentatively accepts the parallel between this transition and that known from lowland peats to the south and east of the North Sea, where this transition is that from the Boreal to the Atlantic period. From the maps showing the existing pollen records for the 'birch-pine period' (Boreal), it appears that there was a great preponderance of birch in Northern Britain, while a very definite mixed oak forest element was present in the south and east. Hazel also was often abundantly represented. The succeeding 'alder period' (Atlantic) left peats in which pine pollen is generally inconspicuous, except in Northern Scotland. Dr. Godwin points out one serious difficulty in dealing with British deposits, namely, that there is usually no well-marked transition in the proportions of tree pollen after the Atlantic period. For this reason, and also because changes in Britain may not have synchronised with those on the Continent, accurate geological or other dating of the British deposits will be essential if a true picture of the major post-glacial changes is to be realised.

One type of problem which is likely to arise is well illustrated in details reported in *The Irish Naturalist* for November, 1934. This number deals exclusively with the work of a special committee which has organised detailed work on the quaternary deposits in Ireland. A principal feature of this work is that only sites containing dated archæological or geological horizons are to be investigated. In a preliminary report of the first summer's work (1934), Prof. Knud Jessen makes some tentative conclusions from the pollen analyses. It appears that the Bronze Age forests in Ireland (of oak, alder, birch and pine) extended right to the western coasts and also much higher up the mountains. Forests are now absent from the West of Ireland. Their disappearance and replacement by bog appears to have been due to a widespread increase in moisture in the later part of the Bronze Age. If this transition is contemporaneous with the well-known sub-boreal sub-atlantic climatic change (on the Continent), the late Bronze Age in Ireland will synchronise with the early Iron Age (Halstatt period) on the Continent about 500 B.C. It will be evident also that the results of the Irish investigations will, if confirmed, be of extreme interest in comparison with the development of the Pennine peats.

MARINE ZOOLOGY NOTES AND RECORDS FROM SCARBOROUGH

W. J. CLARKE, F.Z.S.

FEEDING HABITS OF THE COMMON SEAL.

A SMALL party of about half a dozen common seals have lived in Scarborough South Bay for several weeks during January and February, 1935, and some are still there at the time of writing. One of these spends a great deal of time inside the harbour, and not being molested, is getting fairly tame. It fishes industriously and frequently brings to the surface of the water examples of the eel-like viviparous blenny. These lively creatures twine round the seal's nose and often give it some trouble before being subdued and swallowed. On one occasion a hungry herring gull suddenly swooped down and snatched the fish out of the seal's jaws. On one occasion, when it brought up a larger fish, apparently a coalfish, it sat upright in the water, clasping the fish in its flippers, and ate it piecemeal. I have once before seen a seal treat a codfish in the same way, the fish in this instance being of about 10 lbs. in weight. The whole of this was eaten above water, the seal then dived and brought up another smaller codling

which was treated in the same way, the seal meantime sitting upright in deep water.

LARGE OCEANIC SQUIDS.

Four large squids have been stranded at or near Scarborough during the present year.

One said to measure 6 ft. overall was found stranded on the beach near Hunmanby Gap on January 23rd, 1935, by a man named T. Temple, of Filey.

Another which measured 4 ft. 6 ins. overall was found by Mr. J. S. Rawling, of Scarborough, stranded at Burniston Bay on January 25th, 1935.

Unfortunately, both these specimens fell into the hands of fishermen and were cut up for bait, no portion being preserved for examination, so their identity must remain unknown.

On January 31st, 1935, when the members of the Jolly Rogers Bathing Club went for their early morning dip, they found on the beach in the South Bay, Scarborough, a good example of *Sthenoteuthis caroli*, dead, but in quite fresh condition. It measured exactly 5 ft. in length overall. They kindly allowed me to send the specimen to the Hull Museum, where it has been preserved.

Another example of *S. caroli* was found on the beach 1½ miles north of Scarborough on February 15th, 1935. It also was in quite fresh condition and is preserved in the Scarborough Museum. This specimen measured 5 ft. 2 ins. overall.

LESSER FORKBEARD (*RANICEPS RANINUS*).

An example of this curious fish, measuring 8½ ins. in length, was washed ashore after a rough sea on the North Sands at Scarborough on February 7th, 1935. This North-east Atlantic fish is not very common in British coastal waters, but is more abundant further north where rocky coasts are to be found, and it is a common species off Norway. I have records of several other examples in the Scarborough district.

HERMAPHRODITE COD.

Codfish which exhibit the characteristics of both sexes turn up from time to time in the Scarborough fish market. On January 29th, 1935, a small specimen about 5 lbs. in weight contained both roe and milt combined, of which I obtained a photograph, the roe being now in the Scarborough Museum.

On February 21st another example about the same size was found which also combined both sexes in the same individual.

POLLINATION IN THE PINE

J. DOYLE, D.Sc.

ANYONE possessing even a cursory knowledge of Botany has learnt of the interesting phenomena associated with pollination in the Flowering Plants. The carriage of pollen by insects and the marvellous inter-relationships between these and the flowers have naturally attracted greatest attention, but even the cursory student knows that flowers can also be pollinated by wind. The adaptations of floral structure in this case are not quite so spectacular but, in their own way, are neat

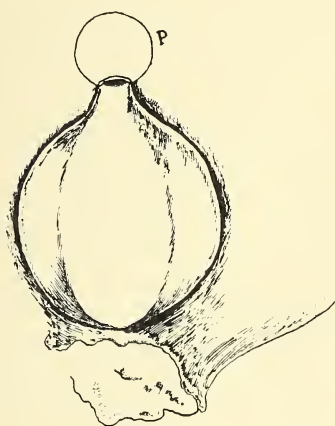


FIG. 1.

Ovule of a Cypress attached to a scale which has been removed from the cone to show position and approximate size of the pollination drop, P.

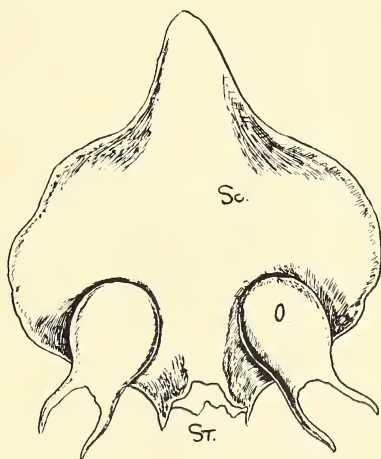


FIG. 2.

Inner side of ovuliferous scale of *Pinus* removed from the cone.

Sc., main body of scale; St., stalk of attachment to cone axis; O, one of the ovules.

and successful, the importance in the world's vegetation of the vast family of the grasses, for example, clearly indicating how successful this wind-pollination can be. Now the conifers also are all pollinated by wind, but in many of the forms belonging to the group we do not find in the literature as much information as we would desire about the actual details of structure and behaviour. This lack of knowledge applies particularly to that very important section of the Conifers, the Abietineæ, to which belong the common Pine and its allies such as the Cedar, the Spruce, and the Larch. Here, however, it is only proposed to give an account of some field and laboratory observations on *Pinus sylvestris*. The general interest of this tree, which most of us know so well, being one of the few conifers indigenous to these islands as well as being

also of great economic importance, must excuse this addition to the volume of material which has been written about it.

It is necessary, at the outset, to remember the fundamental difference between a conifer and a flowering plant. In the latter, the young seed rudiments, or ovules, are enclosed in the pistil, which usually projects a certain distance, ending in a special receptive area, the stigma, to which the pollen-grains adhere. The grains germinate as fine long tubes growing down through the tissues of the pistil till they reach the cavity in which the ovules are enclosed. In the conifer, on the other hand, the ovules are not so enclosed but are carried, freely exposed, usually on some form of scale in the young cone. At pollination the scales are well separated so that the ovules can be seen with ease, frequently with the naked eye, always distinctly with a hand-lens. The pollen-grains thus blow in between the scales and have actually direct access to the ovules themselves.

There is one very common type of pollination mechanism, which is often described as if characteristic of all the conifers, the so-called pollination-drop mechanism; but, although undoubtedly very widespread, it does not seem to occur in the group in which, for the moment, we are most interested, namely, the Abietineæ. A brief reference to it is, however, a useful introduction to the type of mechanism to be found in *Pinus*. It can be seen in any common Cypress. If the young cones at the ends of the branches of a Cypress be examined when the pollen is flying, there can easily be seen the small scales with numerous freely exposed ovules clustering between the scales and the cone axis. Each ovule consists of a central mass of tissue, the nucellus, surrounded by an outer protective envelope, the integument. One ovule attached to a scale is shown in Fig. 1, the other ovules having been dissected away. The ovule, as can be seen, narrows towards the top. Here the integument projects beyond the enclosed nucellus in the form of a symmetrical tube, the micropylar tube, the actual opening being called the micropyle. When ready for pollination, fluid is secreted by the nucellus and appears at the micropyle as a small round drop indicated approximately to scale by the circle P in the figure. These drops can be seen quite clearly even with the naked eye, glistening in the light, and in these the pollen-grains are caught as they float along in the air currents—the term pollination-drop has therefore been used for them. Further details do not concern us, it must suffice to say that the drop is eventually retracted and the grains get lodged inside the ovule on the nucellus. This mechanism, the exudation from a symmetrical micropyle of a fairly stable, readily discernible spherical drop of fluid in which the pollen is caught, is, as

already mentioned quite common among the conifers. But the Abietinean group show more highly modified and varied adaptations, there being five quite distinct pollination mechanisms to be found among them, of which that in *Pinus* is one of the most interesting.

When considering *Pinus* more closely the structure of a Pine cone must be briefly recalled. In the old cone it seems composed of a number of hard woody scales attached to a central axis, these scales separating later to free the seeds. In the young cone the fundamental structure can be seen more easily. In May, when the buds burst, there can be

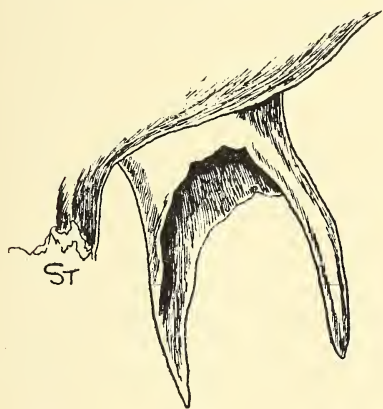


FIG. 3.

Outer side of ovule enlarged to show micro-pylar area projecting below the scale.

St., stalk of attachment to cone axis.

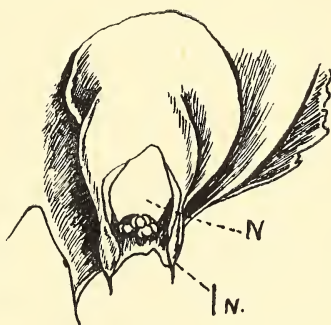


FIG. 4.

Ovule of *Pinus* with integument partly dissected away to show pollen-grains on the nucellus.

N., nucellus ; In., integument.

seen, at the extreme end of some of the young shoots, small red bodies, one to three in number, which are the young cones. Examined with a hand-lens they show a close spiral of reduced leaves or bracts, each bract carrying in its axil, that is, between itself and the axis of the young cone, another flat body, the ovuliferous scale, so-called because on it are to be seen two ovules. Such a scale as seen from the inner side, the side facing the cone axis, is shown in Fig. 2. On it the position of the two ovules is indicated and it will be noticed that the ovules are practically inverted. This simple point is of importance. If the young branch carrying the cones be looked at again it will be seen that it stands vertically. It does not matter what may be the lie of the older branch from which it arises or even what its own permanent lie may be later in the year, but at pollination it will always be found standing erect. The little terminal cones thus stand erect also which means

that the ovules are actually inverted in space. It follows, therefore, if pollen is to reach the nucellus of the *Pinus* ovule, that it must pass along the micropylar tube in an *upward direction* against gravity.

The general structure of the ovule, particularly of the micropylar area, is also important. The inner side of the complete ovule is seen in Fig. 2, while in Fig. 3, at a greater magnification, is seen the outer side of the scale with the micropylar part of the ovule projecting below it. Unlike the Cypress the micropyle is not symmetrical. The opening leading to the enclosed nucellus is relatively wide, the integument is further extended on the inner side than on the outer and is drawn out laterally into two long projections or arms. This whole appearance is characteristic of most species of *Pinus*.

Now if we refer to most of our introductory text-books, and even to more advanced ones, we find no function given to these arms or, indeed, to the general micropylar structure, but, in practically every case, a statement is found to the effect that fluid is exuded from the micropyle and that in this the pollen-grains are caught. The fluid is sometimes spoken of as a pollination-drop and in one case even drawn as a nice round drop at the ovular mouth. Impelled by curiosity to see this drop in action it was early clear that if it existed it was more illusive than the typical pollination-drop to which reference has already been made. In the forms in which this latter occurs it can always be found with ease at any time of the day, in at least some of the ovules; in the Yew, for example, it can be seen glistening at a distance of a couple of yards. But, although many Pine trees were looked at in the field over three seasons, at all hours of the day, both before and during the period when pollen was flying, no fluid exudation could be found in any of the ovules from the hundreds of cones examined. In two ovules only, from among them all, was a slight suspicion of moisture seen, deep down in the micropyle, during the daylight hours. There was clearly a problem here for solution—if no fluid is exuded, how can grains *ascend* in the micropyle or, if fluid is exuded, why is it so elusive in the field? This elusiveness in the field was all the more remarkable when it was found that, if young branches carrying unpollinated cones were kept in water in a damp atmosphere under a bell-jar, then a copious secretion of fluid could be observed from most of the ovules of the cones. This secretion, of course, might have been explained away as due to the surcharging of the tissues with water under the unaccustomed conditions of saturation, but it was strongly suggestive that in some way fluid played a part in the transfer of the pollen to the nucellus.

The general mechanism and the part played by fluid was finally followed out as working mainly in this manner. The young cones, when they first burst from the bud, are apparently still immature. They may be exposed to pollen, but pollen does not manage to reach the nucellus, nor, if brought into a moist atmosphere, can the ovules be induced to exude fluid for a period of about 48 hours. Now in the Pine, although seed cones and pollen cones may not always ripen simultaneously on the same branch yet, on the various branches over the tree, cones in various stages will be found. Thus, excepting a very few of the earliest of the young seed cones, when most of these burst from the bud, there will be, if the trees are coning well, pollen flying in their neighbourhood, and the young cones, still immature, will be exposed to the pollen-rain for some time. Here comes in the function of the arms. They are composed of turgid translucent tissue, just like the stigma tissue in many flowers, and to them the pollen-grains readily adhere; and at this stage it is easy to find many ovules with pollen-dusted arms, but with no pollen yet on the nucellus. The ovules, in the meantime, gradually reach maturity and become capable of fluid secretion. Now such secretion actually does occur in nature, but as far as our observations show is essentially a night phenomenon. It was not found, as already stated, even in unpollinated ovules, during the day hours, but can be seen with comparative ease during the night; apparently it is secreted in the early night hours and reabsorbed in the morning hours. This period has not yet been followed out fully, so that it cannot be said how soon after nightfall in May the exudation begins nor at what early hour the fluid is reabsorbed, but between 1 a.m. and 3 a.m. the fluid can be readily found in its typical condition, while by 7-30 a.m. the ovules are once more dry. If ovules have matured without pollen having reached the arms, it is still uncertain how frequently this phenomenon can be repeated.

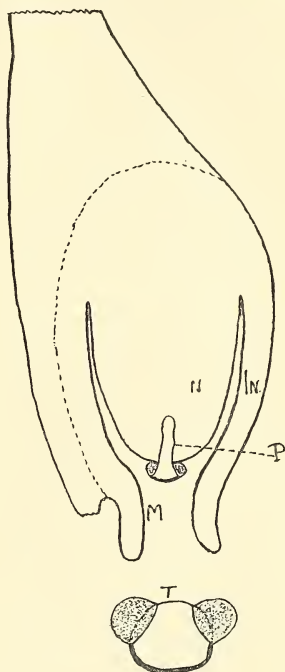


FIG. 5.

Diagrammatic section of *Pinus* ovule to show how the wings help to orientate the pollen-grains on the nucellus.

In., integument; N, nucellus; M, micropylar canal; T, area from which pollen tube grows; P, pollen tube invading the nucellus.

It is only for a period of less than a week in May that field observations can be made, as pollination in the Pine is over fairly quickly, so some points are still naturally not quite cleared up, but it is probable that such repetition can take place for perhaps three successive nights. In the overwhelming majority of the ovules, however, only one such exudation of fluid is required. The fluid, secreted by the nucellus, fills up the micropylar canal flush with the ovular mouth, and is further drawn out by surface tension as a film along the arms for a distance of about one half their length. Under the bell-jar the secretion may be much more copious but in nature it has never been seen in greater quantity than just sufficient to form this film between the arms. This film development under surface tension takes place very rapidly as soon as the fluid fills the micropylar cavity so that the whole process now being described occupies a very short time. The pollen-grains are very easily wetted so that, as the film spreads quickly between the arms and comes into contact with the grains adhering to them, these grains are at once enclosed within the surface of the film. This enclosure results apparently in a rapid slight increase in surface tension and frequently, at any rate, the film withdraws, with the enclosed grains, practically to the level of the micropylar rim.

Now, as is well-known, the pollen-grains of the Pine are provided with two bladder-like swellings of their coat—the wings; and it has often been suggested that these wings help in the spread of the grains by wind. They may have some such function, but it is remarkable that in the Larch and the Douglas Fir the grains have no wings, although they may be twenty times bigger than those of the Pine, and yet are spread very efficiently by air currents as examination of ovules of these show at pollination time. But it is beyond question that the wings on the pollen-grains of the Pine render them very buoyant in water. It will be readily found that, among the conifers, all wingless grains sink rapidly in water while, in the case of the winged grains of the Pine, if stirred up in water they rise quickly to the surface. The interest attaching to the fact that the ovules are inverted is now clear. The grains are enclosed in the little vertical tube of water in the micropylar canal, and owing to this buoyancy must rise in it—they thus pass along the micropylar tube in an *upward* direction, and by this mechanism alone could reach the nucellus.

But this process is furthered in a quite spectacular manner. Very shortly after the grains have become immersed in the fluid it can be seen that the fluid has begun to retract into the ovular mouth; it is being rapidly reabsorbed by the ovule. This reabsorption can be stimulated by the presence of even only three grains in the fluid. The duration of the absorption

is short. In most cases it is very marked within five minutes and, within ten, the whole inner area of the micropylar canal is dry, the pollen being neatly deposited in a small depression of the nucellar apex; in other cases the whole process may only occupy about five minutes. It is interesting, for instance, when ovules, with exuded fluid but as yet unpollinated, are available at night, to introduce a few grains into the secretion of one of the two ovules of a scale leaving the other without pollen. The rapid disappearance of the fluid with pollen and the completely unchanged condition of the other is very striking. An ovule with the integument dissected away is drawn in Fig. 4 to display the nucellus with the grains now lodged in the apical depression; and the pollination has been successfully effected.

The fluid is not again secreted if once reabsorbed due to the presence of pollen. Within a couple of days the tissues of the micropylar canal begin to grow and swell till they meet on the inside completely closing the opening, thus protecting the grains and the developing pollen-tubes. This closure growth shows as a bulge on the outside of the neck of the ovule. The arms, having carried out their stigma-like function, gradually wither away. The whole mechanism is very effective and, on trees where pollen is flying freely, it is difficult to find cones whose ovules have not been pollinated.

Many other points of interest, both in *Pinus sylvestris* and in other Pine species, must be omitted for the present. Pollen of one species of Pine, for example, will stimulate the rapid retraction of the fluid in other species so that interspecific crossing can be readily effected; while dichogamy, both in the form of protandry and of protogyny, is very marked in certain species, at any rate in cultivation. But one further point in connection with the pollen-grain of *Pinus sylvestris* perhaps merits further description. The wings of the grain not only cause it to float but cause it to float in a definite way—with the wings on the upper side. The point is illustrated in a very diagrammatic way in Fig. 5. The large grain drawn near the mouth of the ovule is shown in this floating position. Now later when the grain germinates it sends out a fine tube boring through the tissues of the nucellus and this tube arises from the part of the grain between the wings on the upper side—the part marked T. It will be clear that, as the grain thus rises in the micropylar tube with the wings uppermost, it will tend to come to rest on the nucellus with just that part of the grain from which the tube will grow in contact with, or at least very close to and facing, the nucellus as shown in the smaller grain drawn in the body of the ovule. If a large number of grains are settling on the nucellus at the same time their positions may be a little displaced owing to mutual

jostling, but, on the whole, it appears that the wings do help in suitably orientating the pollen-grains upon the nucellus.

It is clear, therefore, that although the Pine, in so far as fluid is utilized in the pollination mechanism, shows some slight affinity with those forms which develop a true pollination-drop, yet the essentials of the mechanism are quite distinct. The pollen is caught on the micropylar arms which function like the stigma in an ordinary flower, the fluid only facilitating its subsequent passage to the nucellus. It is of interest then that in other genera of the conifers, particularly the Larch, the Douglas Fir, the Cedar, and the Hemlock, pollination is achieved by stigmatic devices only.

Sincere thanks are due to Miss M. O'Leary, M.Sc., for drawing Figs. 1 to 4.

FIELD NOTES

Seedling Notes.—During a visit to Byram Park, near Ferrybridge, in June last, a noticeable feature among the ground vegetation of the wooded areas alongside the lake was the seedling plants of holly (*Ilex aquifolium* L.), yew (*Taxus baccata* L.), and box (*Buxus sempervirens* L.) in all stages of development. The latter in particular appeared in good numbers in the immediate vicinity of the parent trees, whose height was from fifteen to twenty feet.—W. E. L. WATTAM, Newsome.

***Viscum album* L. (Mistletoe).**—There is quite a large healthy plant growing on an aged apple tree in the gardens attached to Gunthwaite Hall, near Penistone. I have known of its existence from a very early stage and covering a period of over twenty-five years. I have never been able to satisfy myself as to whether it has been artificially introduced or not. It was in flourishing condition in June last, but devoid of berries. On enquiring from the present tenant of the gardens I was surprised to learn that the plant had never been known to produce berries.—W.E.L.W.

***Sambucus racemosa* L. (Scarlet-berried Elder).**—There are four specimens of this tree forming part of the wind screen to allotments in Newsome Road, Huddersfield. They have been planted upwards of fifteen years, but have not, until 1934, produced either flowers or fruit. In August last the abundance of scarlet berries caused much comment during the brief time they remained unconsumed by starling, black-bird and mistle thrush. Judging by the manner in which the seed is dispersed it is quite likely that this tree may, in the near future, become established in diverse habitats in our district.—W.E.L.W.

Felling of Beech (*Fagus sylvatica* L.) near Huddersfield.—During the autumn of 1934 an extensive area of the

older portion of Storthes Hall Woods, Kirkburton, where magnificent specimens of beech were dominant, has been felled. On a visit to the site in December last I spent a little time in counting the annular ring growths on the bases left in the ground. On this basis it would appear that the felled trees were aged from seventy-eight to ninety-four years.—W.E.L.W.

Dent Dale Lichen Records.—In May, 1933, I found *Peltigera rufescens* Hoffm. and its variety *prætextata* Nyl., and *Stereocaulon denudatum* Floerke in Scother Ghyll. Both are additions to my previous list of lichens occurring in this ghyll published in *The Naturalist*, 1921, pp. 276-277.—W.E.L.W.

Bishopdale Lichen Notes.—A very brief investigation at Kidstones, in the upper part of the dale, in May, 1934, resulted in the following species being noted on the tree boles (oak, ash, mountain elm and sycamore), viz.: *Cetraria glauca* Ach., *Evernia furfuracea* Mann. and its var. *ceratea* Cromb., *Parmelia physodes* Ach., *P. saxatilis* Ach. and its var. *furfuracea* Schaer., *P. fuliginosa* var. *lætevirens* Nyl., *Lecanora muralis* Schaer., and *L. conizæa* Nyl. The walls (a mixture of silicious and calcareous stones) yielded *Parmelia sulcata* Tayl., *P. fuliginosa* Nyl., *Xanthoria parietina* Th. Fr. and its form *virescens*, *Physcia hispida* Tuckerm., *Lecanora campestris* B. de L., *Cladonia pyxidata* Fr., *C. fimbriata* Fr. *Lecidia coaractata* var. *Belacista* Cromb., *Lecidia contigua* Fr. *Lecanora symmictera* Nyl. was noted on old palings. About a mile lower down the road, near to Ribba Hall, the calcareous walls yielded *Collema pulposum* Ach. and *C. cheileum* Ach., and amongst the mosses an abundance of *Peltigera canina* Willd., and *P. rufescens* Hoffm. and its variety *prætextata* Nyl.—W. E. L. WATTAM, Newsome.

EDUCATIONAL FILMS.

We are pleased to be able to announce that Messrs. George Newnes, Ltd., have just brought out a new monthly journal devoted to this important subject. The title of the journal is *The Educational Film Review*, and the Editor is Mr. Percy W. Harris, who has directed with conspicuous success the sister journal, *Home Movies and Home Talkies*. This country is behindhand in the development of cinematography for educational and cultural purposes, and this new Review should be very generally welcomed. Naturalists should be specially interested, and it is apparent that the editor realises this, judging from the contents of No. 1 (April). Two of the twenty articles are on 'Slow Motion as an Aid to Instruction,' and 'Stop Action Films,' the latter dealing with a simplified technique for the production of moving pictures of such subjects as the growth of plants, development of crystals, etc. The price of the journal is sixpence.

ADDITIONS TO THE NATURAL HISTORY OF SEMERDALE

J. M. BROWN, B.Sc., F.L.S., F.R.E.S.

SINCE the visit of the Yorkshire Naturalists' Union at Whitsuntide, 1934 (as reported in *The Naturalist*, July, 1934), three further visits have been made to Semerdale (in early August, early September, and late October), and a considerable amount of additional information relative to the natural history, mainly entomological, has been collected.

At the time of the August and September visits the water in the lake was such that a certain amount of marginal collecting was possible, and the following nymphs and larvæ were obtained: *Habrophlebia fusca*, *Heptagenia lateralis*, *Ecdyonurus venosus*, *Siphonurus lacustris*, *Baetis* sp., and *Limnophilus* sp. It will be noticed that some of these are more characteristic of running waters than that of lakes, but occurring as they did under the marginal stones where wave action would tend to increase the oxygen content of the water, their presence would not be exceptional. *Gammarus* and *Ancylus* also were present in number. On the surface of the water of the lake, the small Collembolan, *Sminthurides malmgreni* var. *elegantula* (Reut.) occurred in large numbers, and among the marginal shingle the Hemiptera, *Salda littoralis* L., *Acanthia saltatoria* L., and *A. scotica* Curt., were quite numerous in August and September.

In the neighbourhood of the lake, mainly on the north-western shore, the following insects were taken on the wing:

MAYFLIES:

Paraleptophlebia cincta Retz. Sept. and Oct.

Centroptilum luteolum Müll. Aug. and Sept.

Ecdyonurus venosus F. Sept.

Habrophlebia fusca Curt. Aug.

STONE-FLIES:

Leuctra geniculata Steph. Aug. and Sept.

L. fusciventris Steph. (*Klapaleki* Kmpy.) Aug., Sept., and Oct.

Nemoura variegata Oliv. Sept. and Oct.

Nemurella inconspicua Pict. Sept.

CADDIS-FLIES:

Limnophilus sparsus Curt. Aug. and Sept.

L. lunatus Curt. (plentiful). Sept.

Leptocerus cinereus Curt. Aug. and Sept.

Mystacides azurea L. Sept. (plentiful).

Polycentropus multiguttatus Curt. Aug. (plentiful).

Cyrmus trimaculatus Curt. Aug. and Sept. (plentiful).

Wormaldia subnigra McL. Aug. and Sept.

The River Bain also was less flooded than at the time of the May visit and the submerged stones more easily examined, and some additions can be made to the list of nymphs and larvæ noted there:

Heptagenia lateralis, *Ephemerella ignita*, *Centroptilum* sp. (Mayflies), *Hydropsyche pellucidula* (Caddis), and *Tanytarsus* (Diptera), and among the marginal stones the active Collembolan, *Agrenia bidenticulata* (Tullb.) a species found frequenting upland streams, were plentiful. *Gammarus* as usual was present in large numbers.

Insects taken in flight in the neighbourhood of the River Bain included:

MAYFLIES:

Baetis pumilus Burm. Sept.

B. bioculatus L. Sept.

B. rhodani Pict. Sept.

B. tenax Eat. Sept.

- B. vernus* Curt. Oct.
Centroptilum luteolum Müll. Aug. and Sept.
C. pennulatum Eat. Sept.
Cloeon rufulum Müll. Sept.
Heptagenia sulphurea Müll. Sept. (very plentiful).
Ecdyonurus longicauda Steph. Sept. (very plentiful). The nymph of this species was noted in the Whitsuntide Report as being apparently the dominant Mayfly in the stream, and it was of interest to find the adult fly so plentiful later in the season.

STONEFLIES :

- Leuctra geniculata* Steph. Sept.
L. fusciventris Steph. Sept. and Oct.
Nemoura variegata Oliv. Sept.
Nemurella inconspicua Pict. Sept.

CADDISFLIES :

- Hydropsyche pellucidula* Curt. Aug. and Sept.
Tinodes waeneri L. Sept.
Polycentropus multiguttatus Curt. Sept.
Rhyacophila dorsalis Curt. Sept. and Oct.
Glossosoma vernale Pict. Sept.
Oxyethira costalis Curt. Sept.
Hydroptila sp. Sept.

In Raydale Beck (near Raydale Grange) a number of nymphs and larvæ were collected including : *Baetis* sp., *Centroptilum* sp., *Ecdyonurus venosus* (in various stages), but no *E. longicauda* were seen, *Plectrocnemia* sp., *Rhyacophila* sp., *Hydropsyche pellucidula*, and pupae of a *Stenophylax* (which emerged later as *S. latipennis* Curt.), *Leuctra* sp., and both *Perla cephalotes* and *C. carlukiana*. *Gammarus* was present also.

By sweeping among the damp herbage, chiefly at the northern end of Semerwater, a number of Hemiptera were taken. These included :

- Reduviolus limbatus* Dahlb. Aug. and Sept.
Teratocoris saundersi D. and S. Aug. and Sept.
Lygus pratensis L. Sept.
Mecomma ambulans Fall. Sept.
Cyrtorrhinus caricis Fall. Aug. and Sept.
Philaenus spumarius L. Sept.
P. lineatus L. Sept.
Euacanthus acuminatus Fab. Aug.
E. interruptus L. Sept.
Euscelis sordidus Zett. Aug.
Deltocephalus distinguendus Flor. Sept.
Limotettix lunulifrons Dahlb. Aug. and Sept.
Cicadula warioni Leth. Aug.
Eupteryx urticae Fab. Sept.
E. auratus L. Sept.
Megamelus notula Germ. Aug. and Sept.
Conomelus limbatus Fal. Aug. and Sept.

Beating the trees neighbouring the lake, chiefly Hazel, Sallow, and other Willows, and Alder yielded :

- Temnostethus pusillus* H. S. Sept. Both short-winged and long-winged forms.
Anthocoris confusus Reut. Sept.
A. nemorum L. Sept.
A. nemoralis F. Aug.
Phytocoris populi L. Sept.
Plesiocoris rugicollis Fall. Aug.
Lygus contaminatus Fall. Sept.

L. viridis Fall. Aug., Sept., and Oct.
L. rubricatus Fall. Sept.
L. cervinus H. S. Sept.
Malacocoris chlorizans Fall. Sept.
Psallus roseus F. Aug. and Sept.
Cercopsis alni Fall. Sept.
Oncopsis alni Schr. Sept.
Idiocerus elegans Flor. Sept. (Raydale).
I. lituratus Fall. Sept. (Raydale).
I. populi L. Sept. (Raydale).
I. confusus Flor. Aug. and Sept.
Typhlocyba geometrica Schr. Oct.
Zygina alneti Dahlb. Sept.
Psylla peregrina Forst. Sept.
P. costalis Flor. Sept. and Oct.
P. alni L. Aug., Sept., and Oct.

Among the mammals the Weasel and Hedgehog can be added to the earlier list, and of the birds the Kestrel and Snipe were occasionally seen, the Heron was frequently noted about the upper end of Semerwater, and the Kingfisher was seen almost every day during the September visit, about the River Bain.

YORKSHIRE ENTOMOLOGISTS AT LEEDS

W. D. HINCKS, M.P.S., F.R.E.S., M.S.B.E.

A MEETING of the Entomological and Plant Galls Sections of the Union was held at the Leeds Church Institute on Saturday, October 27th, 1934.

Mr. J. M. Brown occupied the chair and fourteen members were present.

The sad death of Mr. M. L. Thompson was referred to and those present stood in silence in his memory.

An interesting feature of the afternoon meeting was the wealth of exhibits. Mr. Cheetham showed a box of new or little-known Yorkshire *Diptera* and commented on the unfavourable season. Mr. Walsh read a most instructive paper dealing with the relation of *Coleoptera* to environmental moisture, which will be published by Mr. Walsh elsewhere.

Mr. W. P. Winter demonstrated a method of preserving spiders and showed some galls put up in a similar manner. On behalf of Mr. Burkill, Mr. Winter exhibited and explained a collection of interesting galls.

Mr. A. E. Winter had *Sirex noctilio*, *Odynerus spinipes* and a melanic *Vespa* sp. from Harrogate.

Mr. Butterfield passed round a box containing a nearly complete collection of British *Pterophori*.

Mr. Dibb showed various interesting local insects and a box of several orders from Cornwall.

Messrs. Wood and Hincks exhibited boxes of Yorkshire insects taken during the season, including additions to the county list.

Mr. J. M. Brown had a box containing some scarce Yorkshire *Hemiptera*, *Gnathocerus cornutus* from Sheffield, and a new Yorkshire Mayfly, *Ameletus inopinatus*. Mr. Brown also exhibited *Ecdyonurus longicauda* and *venosus*, the former an addition to the county list, and discussed the specific distinctions of the two.

The evening session was devoted to the consideration of recorders' reports, which were in agreement that the past season had been unfavourable for insects.

The nomination of officers and routine business concluded a very successful meeting.

Y.N.U. VERTEBRATE ZOOLOGY SECTION

E. WILFRED TAYLOR.

A MEETING of the Vertebrate Section of the Yorkshire Naturalists' Union was held in the library of the Church Institute, Leeds, on Saturday, February 16th. The Sectional Meeting was preceded by a Meeting of the Yorkshire Wild Birds and Eggs Protection Acts Committee.

At the Sectional Meeting the chair was taken by Alderman A. Hirst, J.P., and Mr. C. F. Procter exhibited skins of the Grey Plover, Smew, and a Quail shot near Beverley in January.

Mr. C. F. Procter read a paper entitled, 'Birds of the Estuary,' in the course of which he pointed out that Spurn Head was the most easterly point of North-East England, and therefore formed a natural terminus for migrants arriving from North Europe. The time of arrival of many species seemed to depend very much on the prevailing wind and it was possible to predict the arrival of Woodcock and some other species. Almost all British birds are migrants in some degree and unexpected species such as the Little Grebe and Water Hen have been picked up near the lighthouse.

The waders were dealt with in an earlier paper, but it was remarked that the Black-Tailed Godwit had increased in numbers and was now as numerous as the Bar-Tailed species. Reference was also made to the habit of the Grey Plover of crossing overland from the East to the West coast. The call notes of several of the waders were imitated, and the lecturer expressed his opinion that the Curlew and Redshank had developed a complicated series of call notes that almost amounted to a language. Some of the smaller waders, such as the Dunlin were able to fly in large formations and to execute concerted movements in the air with amazing precision as if each individual responded instantly to some signal which man could not discover.

Small parties of waders could be observed on the East Coast right through the summer and as the individuals were old birds, it was thought that they were too old to breed.

The number of ducks in the winter months was controlled very largely by the condition of the fresh-water creeks, as ducks require fresh clean water, and this is largely controlled by the weather conditions throughout the summer months. The number of Shelduck depend very much on the presence of rabbits, and the trapping of the latter soon leads to a decrease in the number of the former.

Of the Geese the Pink-Footed are increasing and large numbers visit the stubble fields on the Wolds in the autumn. When feeding they post sentries and pack shoulder to shoulder in such numbers that the clover crops are sometimes poisoned with their droppings. Fair numbers of Pink-Footed, Bean and White-Footed Geese frequent the estuary. In foggy weather flocks of Geese frequently get lost and sometimes fly low and uncertainly over the City of Hull. Ducks have more certain instincts and appear to find their way in any weather without difficulty.

At the evening meeting Mr. R. Chislett read a paper entitled 'The Hen Harrier,' which is reported elsewhere in *The Naturalist*. A series of about forty slides was shown and they were, as usual, of great ornithological interest and technical perfection.

Mr. V. S. Crapnell showed a cinematograph film entitled 'Birds of the North.' The first portion dealt with the celebrated Gallery at Ravenglass, and photographs were shown of the species nesting there. The Black-Headed Gulls and Sandwich Terns have large colonies, but the Arctic Tern is not well established, although its numbers have been augmented by arrivals from Walney Island, where they have been disturbed. The Common Tern is now well established and a few pairs of the Lesser nest with the Arctic Terns. At times the whole vast colony of Gulls and Terns fly out to sea without warning, to return again in the

course of a few minutes. This exodus occurred at intervals and the cause could not be ascertained. Photographs of the Ringed Plover and Oyster Catcher were also obtained.

The next portion of the film dealt with birds of the streamside and the moors. Photographs were shown of the Dipper both at the nest and swimming in the stream. The Reed Bunting and Sandpiper followed together with an interesting study of the Moor Hen at her nest. Of the moorland birds the Curlew, Redshank, Lapwing, and Dunlin were shown, the photographs of the latter being obtained near Blackstone Edge. A pair of Ring Ousels were also seen, courageously striving to satisfy the needs of a well-grown and rapacious family.

An interlude followed during which the lecturer and a friend were seen attempting to cross the muddy shore of a lake. This resulted in the loss of a boot and its triumphant recovery.

A series of photographs of the rare Crested Titmouse was followed by studies of the Coal Tit, Missel Thrush, Song Thrush, and Lesser Redpoll. Finally, a panoramic view of the snow-covered mountains of Scotland completed a very interesting and well-illustrated paper.

A vote of thanks to the lecturers and those who had operated the lanterns was proposed and carried unanimously.

REVIEWS AND BOOK NOTICES

British Mycological Society Transactions, Vol. XIX, Part III, February, 1935. Cambridge University Press, London. Price 7/6. In 'Notes on Entomogenous Fungi' T. Petch continues his critical studies of various species or genera of Phycomycetes, Ascomycetes, and Fungi Imperfecti found parasitising insects. '*Poria pearsonii* Pilát sp. n.,' by Albert Pilát (Prague), describes this species from prostrate trunks of *Abies alba* found in Czechoslovakia. As the specimens so named proved to be identical with a plant sent by Mr. A. A. Pearson to M. Bourdot, it may presumably be added to the British list. '*Neurospora* in Britain,' by J. Ramsbottom and F. L. Stephens, deals with the perfect condition of the Hyphomycetes, *Monilia tetrasperma* nom. n. and *M. sitophila*. Other valuable papers in this issue are the following:— 'On *Lambertella corni-maritima* von Höhnelt, a Brown-spored Parasitic Discomycete,' by T. H. Harrison and A. F. El-Helaly; 'Observations on some British Water Moulds (*Saprolegniales* and *Blastocladales*),' by Evelyn J. Forbes; and 'An Experimental and Cytological Study of the Life History of *Endophyllum sempervivi*,' by Dorothy Ashworth. This issue also includes 'Some Further Notes on the Preservation of Petri Dish Cultures,' by S. P. Wiltshire. The part is well illustrated with plates and figures in the text.

Phytoplankton and Herrings. Fishery Investigations, Series II, Vol. XIV, No. 2, 1934, Ministry of Agriculture and Fisheries. (3/6, H.M. Stationery Office). In this report, Mr. R. E. Savage and Prof. A. C. Hardy discuss the influence of phytoplankton in the sea upon the herring fisheries. In the southern part of the North Sea, the main phytoplankton during September to November is composed of the diatom *Rhizosolenia* or the colonial flagellati *Phaeocystis*. When either of these organisms occur in abundance, the catches of herrings fall below the average. It appears that the herrings are diverted from their normal lines of migration by water containing abundant plankton algae and if the zones of water of this type are extensive, the effect is practically to bar the movements of the fish on to the normal fishing grounds.

The Brown Rot Diseases of Fruit Trees. Ministry of Agriculture and Fisheries, Bulletin No. 88, H.M. Stationery Office, 1935, price 1/6 net. This is a valuable compilation of equal interest to the mycologist and the plant pathologist, and is the best guide, from the horticulturalists' point of view, so far published. It is written by

H. Wormald, D.Sc., A.R.C.S., D.I.C., whose own investigations on the subject in the heart of the fruit-growing districts of South-Eastern England have given him an international reputation. The Brown Rots, which produce a 'mummied' effect in fruits rather than a mushy condition, which is a more popular conception of a 'rot,' are caused by the conidial development of species belonging to the genus *Sclerotinia*. These species are discussed and their differences described. All the species of *Pyrus* and *Prunus* cultivated for their fruit are attacked by one or more of these fungi, and their effects on Apple, Pear, Plum, Cherry, Peach, Apricot, etc., are dealt with fully. The conditions conducive to infection and the mode of entry into the host plant are Sections that should be read by all fruit growers, who will also find control measures for preventing the disease adequately discussed. The Bulletin is illustrated by a series of excellent photographs well reproduced.

British Mycological Society Transactions, Vol. XIX, Part II, January, 1935. Under the title 'L.G.Windt and Heteroecism,' J. Ramsbottom contributes an interesting account of the beginnings of plant pathology, as represented by the work of Windt in connecting the occurrence of Black Rust of wheat with the presence of Barberry in the neighbourhood of affected crops. 'A Luminous Agaric (*Pleurotus* sp.) from South Burma' is the subject of a communication by S. R. Bose. The newly-described fungus differs from twelve species of *Pleurotus* known to exhibit luminescence, in having a luminous mycelium, stem, hymenium and pileus, whereas in the other species only the fruit body is luminous. In a 'Note on the Isolation of Single Spore Cultures,' Din Dayal Gupta gives details of the technique employed when a number of pure cultures are required from small conidia, similar to those of *Eurotium herbariorum*. This issue also contains the following papers: 'Observations on *Fomes pomaceus* (Pers.) Big. & Guill. infecting Plum Trees,' by Eileen Fisher; 'Experiments on Finger-and-Toe Disease (*Plasmodiophora Brassicæ*),' by Geo. Potts; 'A Disease of Pomegranite (*Punica granatum* Linn.) due to *Amphichæta Punicæ* n. sp.,' by H. Chaudhury and Jagtar Singh; 'A Brief Account of Fungi present in the Air over Orchards, with a special reference to *Pleospora* and *Polyopeus*,' by F. M. Carter.

The Old Road by **Hilaire Belloc**, pp. 296, frontispiece and map (Constable and Co., price 3/6). This is a reprint of Belloc's classic, first published in 1904 and last reprinted in its old form in 1921. The new edition is on smaller paper and 16 illustrations of former editions have been omitted. The author takes a well-worn highway, that from Canterbury to Winchester and at first theorises on its origin and development and then follows this up with a detailed exploration. It is good that a new generation of open-air enthusiasts should be given an opportunity of reading this fascinating book. It is Belloc at his best.

NEWS FROM THE MAGAZINES

The Entomologist for December contains 'Tinea merdella Zell. and its Allies,' by F. N. Pierce and Rev. J. W. Metcalfe; 'A Catalogue of the Noctuæ of Ireland,' by Lt.-Col. C. Donovan; 'The types of some Genera of Gomphidæ (Odonata)' by J. Cowley; 'Revisional Notes on African and Indo-Australian Species of Terias Swains, 1821 (=Eurema Hbn. 1823),' by A. S. Corbet; 'Notes on the Drinking Habits of Lepidoptera in the Austrian Tyrol,' by Mrs. O. W. Richards; and numerous notes and observations.

The Transactions of the Society for British Entomology, Vol. 1, Part 2, contains 'British Liriopeidæ (Diptera Nematocera),' by H. Audcent (a monograph of the British species with four plates); 'On the Life Histories of some British Hemerobiidæ (Neur.),' by F. J. Killington (*Hemerobius perelegans* Stephens, *Boriomyia betulina* Strem.,

Wesmaelius quadrifasciatus Reut., and *Megalomus hirtus* Linn. The first is a Scottish species, the second and third have been taken in Yorkshire, and the last is extremely rare in Britain; four plates); 'Notes on the Variation of the Ichneumonids, *Angitia cerophaga* Grav. and *A. fenestralis* Grav. (Hym.),' D. O. Boyd (one plate); 'English Names regularly used for British Lepidoptera up to the end of the Eighteenth Century, with a Biographical Account of William Jones, of Chelsea,' by Prof. E. B. Poulton, F. Hemming, and H. M. Edelsten (containing the English names used for British Lepidoptera by A. H. Haworth and William Jones, with their scientific equivalents. With portrait of William Jones); and 'A list of the Lepidoptera of Dorset. Introduction and Part I,' by W. P. Curtis (following the nomenclature of the second edition of Meyrick's Handbook, 1927, treating of the families Arctiadae, Nolidae, Caradrinidae and Plusiadae of the phylum Caradrinina.)

Science Progress for January contains 'Clouds in the Sky and in the Laboratory,' by Sir Gilbert Walker; 'Soil Structure' in relation to Vegetation,' by E. J. Salisbury; 'The Indian Lac Industry,' by T. Hedley Barry; and many other articles relating to Physics, Chemistry, etc. There are the usual notes on 'Recent Advances in Science,' Reviews of Books, etc.

The Essex Naturalist for October, 1934—March, 1935, has 'The Turf and Weeds of an Old Leytonstone Garden,' by Miss Lister; 'The History of Essex Heronries,' by William E. Clegg; 'Some New Fungi from Epping Forest,' by A. A. Pearson; and 'The History of Mycology in Essex,' by J. Ramsbottom.

The Natural History Magazine (British Museum publication) for January has a long article on The Museum of Natural History in Paris; another on 'An Expedition to the Mountains of Papua,' by L. Evelyn Cheesman, both well-illustrated. There are several shorter contributions.

The Entomologist's Record for February contains 'Wicken Revisited,' by H. Donisthorpe; 'Studies in the biology of *P. rapae*, III' by O. Querci (Plate I); '*Leucania l-album* L.,' by G. W. Wynn; 'Early stages of Indian Lepidoptera,' by D. G. Sevastopulo; 'Lepidoptera at Jaca, Alto Aragon, Spain, in August, 1931 and 1933,' by W. Fassnidge; 'Nomenclature. The List,' by H. J. Turner; 'Notes on collecting, etc.' (including a note on a new Tinea, *T. personella* Pierce & Metcalf.); 'Current notes and short notices'; 'Obituary. Dr. F. A. Dixey, F.R.S.'; and supplement, 'Butterflies of the Upper Rhone Valley,' by R. Verity.

The Entomologist's Record for January contains 'Wicken Revisited,' by H. Donisthorpe (with a list of Coleopteta); 'Notes on a new sub-species of *Erebia callias*,' by B. C. S. Warren; '*Brithys crini* Fab. in Britain,' by E. A. Cockayne; 'Nomenclature. The List,' by H. J. Turner; 'Contrexeville, Vosges, France, in June, 1934, and Locquignol, Forest of Mormale, France, in July, 1934,' by Rev. E. B. Ashby; 'Current notes and short notices,' by H. J. Turner; and supplements 'British Noctuae,' by H. J. Turner, and 'Butterflies of the Upper Rhone Valley,' by R. Verity.

The Entomologist's Monthly Magazine for February contains 'The British fungicolous Coleoptera' (concluded), by H. Donisthorpe (an interesting and important article); 'The British species of *Ophonus* Steph.', by C. H. Lindroth; 'New species of *Staphylinidae* (Col.) from Mauritius,' by Dr. M. Cameron; '*Polydrosus pilosus* Gredler (*Curculionidae*, Col.). A species of Coleoptera new to Britain,' by H. Donisthorpe (from Oswestry); 'A new species of *Cixius* (Homoptera, *Cixiidae*) from Snowdon,' by W. E. China (*Cixius cambricus* sp. nov. allied to the continental *sticticus* Rey.); 'The parasites of British birds and mammals. III. On some parasites living in the nest of the house martin (*Chelidon u. urbica* Linn.),' by G. B. Thompson; and several short notes.

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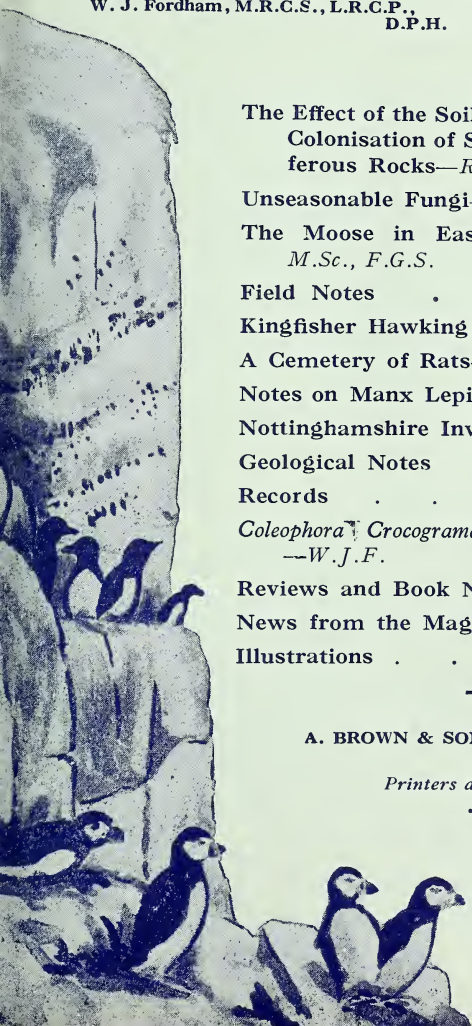
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THE EFFECT OF THE SOIL AND TIME FACTORS IN PLANT COLONISATION OF SOILS DERIVED FROM CARBONIFEROUS ROCKS

R. HOLLIDAY

INTRODUCTION.

THIS paper is written with the intention of placing on record a series of interesting observations regarding weathering and plant colonisation of rocks derived from the Carboniferous series. Part of the observations were carried out on the soil of the district which is a derivative of the underlying Carboniferous sandstone, and part on an old rubble dump. From the map it will be seen that a portion of the surrounding arable land was allowed to go out of cultivation at the time that this dump was being formed.

The dump itself consisted of two parts. (1) The larger part consisted of material derived from the sinking of a ventilator shaft to the railway tunnel which ran directly beneath. This was sunk about 80 years ago, and hence this part of the dump would be of approximately that age. In sinking the shaft several different strata were passed through and the material from these were placed at definite spots on the dump and had given rise to distinct soil types. The two thickest strata were firstly the Coal Measure Sandstone strata and secondly the Coal Measure Shale strata. In consequence the bulk of the dump consisted of material derived from these two strata. (2) This consisted of stone rubble derived from the quarrying operations at the northern end of the dump and was tipped over a portion of the older part of the dump in a layer varying from 2-10 ft. thick. This rubble was placed on the dump during the war and consisted entirely of Carboniferous sandstone. The whole dump was situated on a southern slope and was of such a nature that whilst the northern end was at ground level and the southern extremity was about 25 ft. above land level, the summit maintained approximately an equal height above sea-level the whole of its length.

It will be seen that two distinct soil types may be studied—that derived from the Carboniferous sandstone and that from the Coal Measure Shale. In addition, the different times at which the Carboniferous sandstone had been deposited provided material for the study of colonisation after 20 years and 80 years. Further, the fact that a portion of the near-by arable land was allowed to go out of cultivation at the same time as the dump was made, and, moreover, that this soil was a derivative of the underlying sandstone rock, provided material for the study of the colonisation of two soils derived

from the same rock but which had been weathered for different lengths of time ; the one for 80 years, the other for a more or less indefinite period.

As the whole area under examination was situated in a district with a highly smoke contaminated atmosphere in the heavy woollen district of the West Riding of Yorkshire, the number of species were necessarily restricted.

METHODS OF INVESTIGATION.

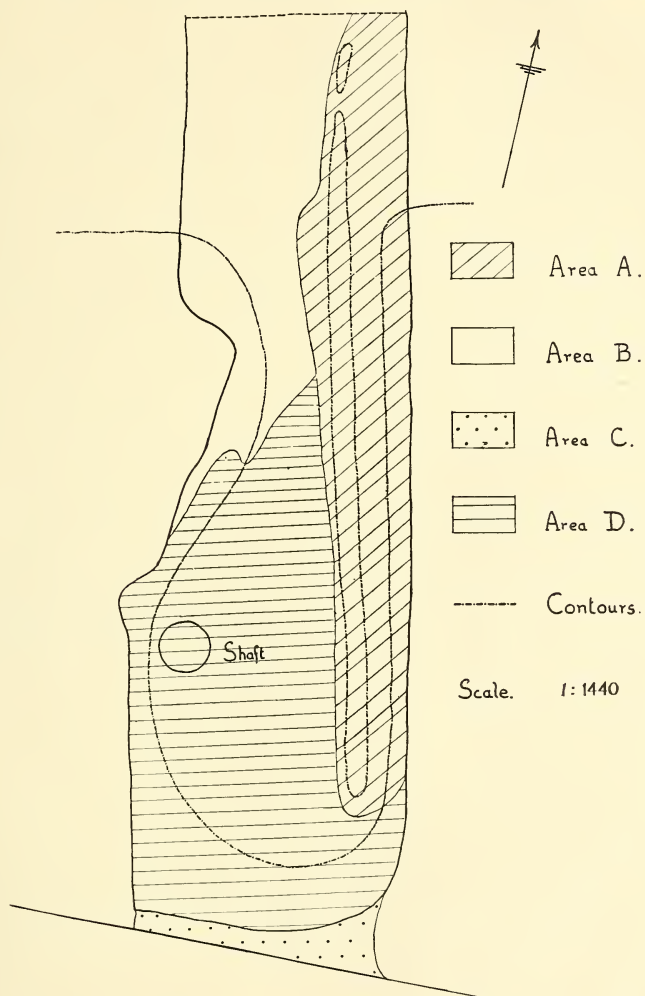
The following is the simple technique employed in the sampling of soils. Twenty trowelsful of the soil were taken at random and well mixed on a sheet of brown paper. The heap of soil was divided into quarters, and two opposite quarters were again mixed, the rest being discarded. This was repeated until approximately 50 grams of soil remained. This was then placed in wide-mouthed bottles and transported to the laboratory. In the laboratory the sample was put through the 100-mesh sieve.

The p.H. of the sample was derived by transferring 10 grams of soil to 100 c.c. of distilled water and thoroughly shaking. The suspension was allowed to settle, 1 c.c. of indicator was added to 10 c.c. and the colour produced was compared with standards on a comparator in the usual way.

All vegetation analyses were determined by the ground-covered method. A 5 ins. \times 5 ins. grid was used, and this was divided into 25 inch squares. Marks were awarded to each species present within the grid in proportion to the total number of small squares occupied. At least 50, and, in some cases, 100 readings were taken on the areas to be analysed. In taking each series of readings the length and breadth of the area under consideration were each traversed twice, the grid being thrown at random at intervals of a few yards. This method of analysis was misleading in portions of the area dominated by *Epilobium* or *Hieracium*, as in March and early April when the readings were taken these two species were only just bursting forth into growth, and, consequently, covered a comparatively small area. Hence an analysis of an area dominated by these species gave a surprisingly low value for them, and this became very accentuated when there was a small occurrence of a gramineous species within the group. Percentage frequency was impracticable over most of the area owing to the difficulty in determining the limits of the individual. Percentage frequency with the tiller as the unit would give even more misleading results, as one shoot of *Epilobium* should correspond to one tiller of the gramineous species.

All measurements taken for the construction of the map were paced, assuming that one pace equalled one yard. For

the purpose of surveying and description the whole area has been divided into four sections which are shown on the map. Area A was the portion on which the Carboniferous



Distribution of Soils on area studied, starting from the base of the figure, the dotted lines represent contours 12 ft. above the general level.

sandstone had only been exposed to weathering agencies and plant colonisation for 20 years; Area B was that portion on which the Sandstone had been exposed for 80 years; Area C was Sandstone which had been weathered for an indefinite period and had at one time been cultivated, but

which had only been exposed to plant colonisation for 80 years ; and Area D was composed of Coal Measure Shale which had been exposed for 80 years.

COMPARISON OF AREAS A AND B.

The soils of both these areas were derived from the same source, namely, from Carboniferous Sandstone Rock, but whereas the original broken rock had only been subject to weathering and plant colonisation for 20 years in the former case, the latter had received exposure for a period of 80 years. This difference in the time of weathering had given vastly different soil types to the respective areas. In the case of Area A the soil was very thin and largely occupied the spaces between numerous stones. In a few places where weathering and colonisation had advanced further than usual, a very thin mat which rarely exceeded $\frac{1}{2}$ ins. was to be found. In Area B there were surprisingly few stones, and the soil was of a uniform and extremely yellow sandy nature. Moreover, in the possession of a mat varying in thickness between 2.5 ins., this area possessed a distinct soil profile. When the soils from the two areas were separated from stones and mat, they were very similar to the eye, and when tested they were found to be of exactly the same acidity, namely p.H. 5.2. The acidity of the overlying mat of partially decayed vegetable matter was found to be p.H. 4.0.

Table I shows that colonisation of the disintegrating rock had been brought about primarily by *Aira flexuosa*. Colonisation had been very slow, as only 36.6 per cent. of the total area was covered by vegetation after 20 years. Colonisation by *Aira flexuosa* had evidently progressed until, after 80 years, there was a nearly pure sward of it. Of the 9.1 per cent. of species other than *Aira flexuosa* in Area B the majority of them were situated in close association with bushes and at the bottom of a rather deep hollow which is not shown on the map. Colonisation of soils of the type described above must be able to tolerate two adverse soil factors. In the first place there would be very little available plant food present. Secondly, the complete absence of organic matter in conjunction with the high percentage of sand would render the moisture holding capacity of the soil very low. In addition, the highly-smoke contaminated atmosphere would further restrict the number of available species. *Aira flexuosa* is a plant which is normally found growing in impoverished situations.¹ Further, it seems that the solid needle like leaves should make the plant relatively resistant to conditions of drought.² It was fairly certain that drought conditions were experienced in the two areas under consideration, as it was quite a regular thing for the leaves of the *Aira flexuosa* to

turn blood red every summer. In summer small patches of clay which occur at a few points may be detected by the fresh green appearance of the *Aira flexuosa* leaves.

It was, therefore, not surprising to find *Aira flexuosa* colonising Area A. After colonisation had proceeded up to a point it might have been expected that the sandy soil would have received sufficient humus from the decomposing leaves, to render the moisture-holding capacity of the soil sufficient to support the growth of broader-leaved species. It has to

TABLE I

General type of Vegetation.	AREA A (20 years)	AREA B (80 years)
	Open association of Tufted Plants.	Closed association. Complete and uniform Sward.
Bare ground	63.4 per cent.	12.9 per cent.
<i>Aira flexuosa</i>	36.6	77.8
<i>Agrostis</i> sp.	Tr.	5.0
<i>Arrhenatherum avenaceum</i> var. <i>bulbosum</i>	—	1.4
<i>Dactylis glomerata</i>	—	0.6
<i>Rubus</i> sp.	—	2.1
Scrub Oaks (<i>Q. robur</i>)	98	7
<i>Rubus</i> bushes	4	15
<i>Sambucus</i> bushes	12	14
<i>Crataegus</i> bushes	9	6
Traces of	<i>Rumex</i> spp., <i>Hieracium</i> spp., <i>Tussilago farfara</i> , <i>Agrostis</i> spp., <i>Holcus</i> spp.	<i>Hieracium</i> spp., <i>Rumex</i> spp., <i>Epilobium</i> spp., <i>Tussilago farfara</i> , <i>Luzula campestris</i> , <i>Holcus</i> spp., <i>Scilla nonscripta</i> .

be realised, however, that the soils derived from the Coal Measure series are almost always acid and inherently short of lime. Further, it seems that the leaves of *Aira flexuosa* are particularly resistant to complete decomposition. The result of these two factors was to produce very quickly an acid mat of semi-decomposed leaves. This mat, with a p.H. 4.0, would be extremely unsuitable for the germination of most grass seeds which might be transported there.³ Under these conditions *Aira flexuosa* seed would be quite capable of germinating,⁴ and so an early formation of an acid mat would favour its spread. A mat was to be found in places on Area A, but this was nowhere thicker than $\frac{1}{2}$ in. On Area B, however, it had an average thickness of 3 ins., and even reaches 5 ins. in places. In the immediate neighbourhood

of bushes it seemed that decomposition of the leaves had proceeded further, resulting in the production of very little, if any, mat and a more soil-like condition. It was significant to note that most of the broader-leaved species were to be found there.

The comparison of two areas of this nature is vastly different from the comparison of the results of controlled plot experiments. In the latter case all factors, except the one being investigated, are uniform for the whole series of plots, whilst in the former case factors of minor importance may influence the results produced by the main variable factor. It is, hence, necessary to consider what effect these minor variable factors have had on the main issue.

In the first place Area B was situated entirely on the western slope of the dump, whilst the greater proportion of Area A was on the eastern slope. In consequence the former would be exposed to the full force of the prevailing west wind, whilst the majority of the latter would be sheltered from it. It was evident that this factor had played an important part on the distribution of the scrub oaks. The total number of scrub oaks on Area B was 7, whereas on Area A it was 98. Further, of these 98, 74 were confined to the sheltered eastern side and only 24 to the western side; of the latter 24, 22 were situated in such a position that small topographical features gave shelter from the west.

Another possible complicating factor was the different angle of the two slopes, that on the east being steeper than that on the west. Analyses of the portions of Area A lying on the east and west slope respectively, gave the following results :—

Area A.			
		Steep East Slope.	West Slope.
Bare Space ...	...	76.0 per cent.	50.8 per cent.
<i>Aira flexuosa</i> ...	...	24.0 ,,	49.2 ,,

The above results show that colonisation was approximately doubled on the less steep slope. It was possible that on the steeper slope the greater movement of soil particles by increased water movement had had a great effect on the establishment of *Aira flexuosa* seedlings. The difference in the angle of slope was only rather slight, however, and it seemed remarkable that it should produce such far-reaching results. It was possible that the question of exposure had in a large measure brought about this difference in the intensity of colonisation.

COMPARISON OF AREAS B AND C.

In the last section the degree and type of colonisation was compared on two areas which had been subjected to soil

weathering and plant colonisation for differing lengths of time. This section deals with the result of 80 years of colonisation on two soils which have been weathered for different periods of time.

The soil of Area B has already been described. The soil of Area C was the ordinary arable soil of the district which had been allowed to 'tumble down to grass.' This piece of land went out of cultivation at the same time as excavation work was being carried out. The soil was of a sandy nature and differed chiefly from that of Area B in the much higher humus content. The soil acidity was less than that of Area B, the p.H. being 5.4. The sections provided by the quarries clearly show that the soil is derived from the underlying Carboniferous sandstone.

One of the most interesting features brought to light by comparison of the analyses of the two areas (Table II) was the tremendous difference in *Aira flexuosa*. From being the dominant constituent of the herbage in Area B it was present in such small quantity in Area C that it could not be represented as a percentage. The other chief differences were the high percentage of *Agropyrum repens* and *Holcus* species in Area C as compared with Area B. This important difference in the dominant species had given fundamentally different types of sward.

The highly weathered soil of Area C was fundamentally different from the poor sandy soil of Area A in that it contained a sufficient quantity of humus to give it a high moisture-holding capacity. In addition, this soil would contain a relatively large quantity of easily available plant food.

These two factors would render the soil highly suitable for plant growth. It was, therefore, to be expected that species which thrive on relatively fertile and moist soils would assume dominance. Besides the difference in the degree of weathering, it has to be realised that one other factor had probably influenced the type of colonisation to a considerable extent. The factor referred to is the availability of species for colonisation. Area C was originally arable land, and as such would contain a full complement of the buried seeds and vegetative portions of arable land weeds. This factor probably accounted for the high percentage of such a typical arable land weed as *Agropyrum repens*. In addition, it is to be noted that whilst there were approximately the same percentages of *Agrostis* species on the two areas, each had a separate variety confined to it; that confined to Area B was a very lax form of *Agrostis stolonifera* var. *compacta*, which was very common on such situations in the locality; that confined to Area C was *Agrostis stolonifera* var. *gigantea*, which was a very typical arable land weed

of the district. Area B having a soil produced directly from the pounded rock without the intervention of an arable period would be entirely free from such a store of seeds and vegetative parts of plants. The presence of such species as *Dactylis glomerata* and *Arrhenatherum avenaceum* var. *bulbosum* in the neighbourhood of bushes indicated that seeds of these broader-leaved species had found their way to this area. The presence of *Agropyrum repens* in the hollow discussed

TABLE II

General type of Vegetation.	AREA B.	AREA C.
	Closed Association. Uniform Sward.	Closed Association. Patchy Sward.
Analysis—		
Bare Ground	12.9 per cent.	4.0 per cent.
<i>Aira flexuosa</i>	77.8 „	Tr.
<i>Agrostis</i> spp.	5.0 „	6.0 per cent.
<i>Arrhenatherum avenaceum</i> var. <i>bulbosum</i>	1.4 „	3.9 „
<i>Agropyrum repens</i>	—	39.8 „
<i>Holcus</i> spp.	—	32.9 „
<i>Festuca</i> spp.	—	7.9 „
<i>Dactylis glomerata</i>	0.6 per cent.	5.5 „
Traces of	<i>Rumex</i> spp., <i>Hieracium</i> , <i>Tussilago farfara</i> , <i>Holcus</i> spp., <i>Epilobium</i> spp., <i>Luzula campestris</i> , <i>Scilla nonscripta</i> .	<i>Epilobium</i> spp., <i>Carduus</i> spp., <i>Scilla nonscripta</i> , <i>Anthriscus vulgaris</i> , <i>Heracleum spondylium</i> , <i>Urtica dioica</i> , <i>Stellaria</i> , <i>Rumex</i> spp., <i>Pteridium</i> .

below showed that the seeds of this plant had also found their way here.

Of particular interest on Area B was a hollow, the vegetation of which was intermediate between that of the two areas under consideration. The actual analysis yielded the following results: *Aira flexuosa*, 50.5 per cent.; *Agropyrum repens*, 16.9 per cent.; *Agrostis*, 14.1 per cent.; *Dactylis glomerata*, 8.9 per cent.; *Aira caespitosa*, 0.5 per cent.; bare ground, 9.1 per cent. This hollow would naturally receive much drainage water from the higher regions of the dump, and so would be unlikely to suffer from drought to quite the same extent. It was, therefore, hardly surprising to find that *Aira flexuosa* gave way somewhat to broader-leaved species. The vegetation in this hollow also showed that the high percentage of *Agropyrum repens* in Area C was not totally due to an initial advantage possessed by this plant in having buried rhizomes in the original arable soil. It was further

interesting to note that the variety of *Agrostis* present in this hollow was largely *Agrostis stolonifera* var. *gigantea*.

COMPARISONS OF AREAS B AND D.

The soil of Area D was derived from the Coal Measure shale brought up from the railway tunnel 80 years ago. The soil of these two areas had hence undergone a similar amount of weathering. The result of the weathering of the Coal

TABLE III

General type of Vegetation.	AREA B.	AREA D.
	Closed Association. Uniform Sward.	Open Association. Very Patchy Colonisation.
Bare Ground	12.9 per cent.	69.8 per cent.
<i>Aira flexuosa</i>	77.8 ,,	20.2 ,,
<i>Agrostis</i> spp.	5.0 ,,	2.8 ,,
<i>Arrhenatherum</i>	1.4 ,,	—
<i>Dactylis glomerata</i>	0.6 ,,	0.6 per cent.
<i>Holcus</i> spp.	Tr.	1.8 ,,
<i>Hieraceum</i> sp.	Tr.	2.8 ,,
<i>Epilobium</i> sp.	Tr.	1.9 ,,
Traces of	<i>Tussilago farfara</i> , <i>Rumex</i> spp., <i>Luzula</i> <i>campestris</i> , <i>Scilla</i> <i>nonscripta</i> .	<i>Festuca</i> spp., <i>Tussilago</i> <i>farfara</i> , <i>Anthriscus</i> <i>vulgaris</i> , <i>Heracleum</i> <i>sphondylium</i> , <i>Rumex</i> spp., <i>Taraxacum officinale</i> , <i>Scilla nonscripta</i>

Measure shale had given a very different product from the result of weathering of Coal Measure sandstone. The shale had become reduced to very small flake-like particles which were bound into aggregates by colloid matter. There was a high percentage of colloid matter in comparison with the soil from Area B. In addition to this, certain other factors render this type of soil unfavourable to plant growth. In the first place the contained organic matter was mainly unavailable, being comparable to coal in nature. Secondly, a toxic ferrous compound intensified the general infertility.⁴ In patches this Ferrous compound had been oxidised to the corresponding Ferric condition giving the soil a brick red colour.

The two soils under consideration were, therefore, fundamentally different in two respects; firstly, the high colloid content of Area D will give it relatively higher moisture-holding capacity; secondly, the presence of the toxic Ferrous compound will render it more inhospitable to plant growth.

It is at once apparent from Table III that colonisation had not advanced so far in Area D as in Area B. Although *Aira flexuosa* appears to be the dominant plant from the

analysis, an eye estimation would show that *Hieracium* and *Epilobium* were the most striking species. The reason that these occupied such a low value in the analysis was to be found in the technique employed as described above. The type of colonisation on Area D was vastly different from that on Area B. In the latter case the whole area was fairly uniformly colonised, but in the former small patches were colonised to a high degree and these were separated by bare areas without a vestige of vegetation. Colonisation on these patches had progressed to a high degree, and such plants as *Anthriscus vulgaris*, *Scilla nonscripta*, *Heracleum sphondylium* and *Taraxacum officinale* occurred regularly, but only in small quantity. These facts seemed to suggest that once colonisation had started conditions become more favourable to plant growth than conditions on Area B. It was significant to note that the soil underlying a patch of vegetation was almost invariably of the brick red colour, indicating that the Ferrous compound had become oxidised to the Ferric. Whether colonisation had proceeded because of this oxidation or colonisation had contributed towards the oxidation is uncertain.

It seems likely, therefore, that the two soil factors had had far reaching and antagonistic effects; firstly, the toxic Ferrous compound had an inhibiting effect and rendered the soil even more infertile than Area B; secondly, the high percentage of colloid matter had given a soil of higher moisture-holding capacity, which in the absence of the previous factor would render the soil more favourable to plant growth. It, therefore, seemed evident that either colonisation had advanced to a high degree on a patch where the oxidation had been brought about, or the removal of the toxic factor in the early stages of colonisation had enabled the colonisation to proceed to a high degree.

SUMMARY.

1. The interrelationship between the time factor in soil weathering and plant colonisation on certain of the Coal Measure soils has been discussed.

2. The effect of two types of soil on the resulting vegetation has been discussed.

3. Evidence has been presented that under the climatic conditions that the observations were made, the most successful coloniser of an infertile, acid and very sandy soil was *Aira flexuosa*.

4. Any factor which increased the amount of available moisture, either by a rise in the water table, an increase of humus (except in the form of a mat), or an increase of other colloid matter tended to increase the proportion of broader-leaved species.

5. It has been pointed out that once *Aira flexuosa* has

started to colonise an area of acid soil, the rapid production of a very acid mat favours its own reproduction to the exclusion of most other species, owing to the peculiar property of the seed in being able to germinate under such conditions.

REFERENCES.

¹ Stowerby, *Grasses of Great Britain*.

² Burr and Turner, *British Economic Grasses*.

³ Dawson (1931), 'The Establishment of Grass Seeds on very acid Moorland,' *Journal of Min. Agric.*, 37, pp. 1188-1191.

⁴ See Appendix.

APPENDIX.

The presence of a toxic Ferrous compound in Coal Measure shale seems to be rather uncertain, and seems to require chemical confirmation. An opinion that the compound is Ferrous sulphide also seems to require confirmation. In view of the fact that the presence of a toxic compound would cast much light on the colonisation of Area D, it was considered desirable to make chemical tests for Ferrous iron and sulphides.

Chemical tests were carried out on the parent shale rock, the weathered shale and the oxidised shale. The parent rock was sampled by taking flakes from the centre of large pieces of shale. The weathered and the oxidised shale were sampled by the method described above (p. 2). All the samples were finely powdered up and air dried.

A qualitative test for sulphides was carried out in the following manner. 50 grams of the sample were placed in 250 c.c. conical flask and 150 c.c. of 50 per cent. hydrochloric acid were added. A filter paper saturated with lead acetate solution was placed over the mouth of the flask and covered by a wide-mouthed bottle. After being left for an hour the lead acetate paper showed no signs of blackening. In each sample a negative result was obtained from this test, and sulphide was hence concluded to be absent.

In testing for Ferrous iron 50 grams from each sample were weighed out and 200 c.c. of 2 per cent. sulphuric acid were added. This mixture was boiled for two hours under a reflux condenser. The object of this was, firstly, to prevent the concentration of the acid, and, secondly, to exclude atmospheric oxygen, both of which would have led to the oxidation of some at least of the extracted Ferrous sulphate.

Aliquot quantities of the filtrates were tested qualitatively for the Ferrous iron by addition of potassium ferricyanide, and for the Ferric iron by addition of potassium thiocyanate. In all cases positive reactions were obtained.

The Ferrous iron was then estimated quantitatively by titration against standard potassium permanganate solution. The following are the results of the titrations and the calculated quantities of Ferrous iron present.

The results of the titrations show that at least 0.29 per cent. of Ferrous iron is present. This would be equivalent to 0.82 per cent. Ferrous sulphate. Assuming the weight of the

Titration Number.	Volume of Rock Extract used.	Equiv. vol. of .0494 N KMnO_4 sol.	Calculated quantity of Ferrus iron per 100grs. material extracted.
1. Original Rock			
<i>a</i>	50	27.5 }	0.29 gms.
<i>b</i>	50	27.3 }	
2. Weathered Rock			
<i>a</i>	50	16.2 }	0.17 gms.
<i>b</i>	50	16.7 }	
3. Oxidised Rock			
<i>a</i>	50	2.1 }	0.02 gms.
<i>b</i>	50	1.9 }	

first 9 ins. of soil to be 1,220 tons, this would be equivalent to an application of approximately 10 tons per acre, a quantity which would in all probability prove toxic to plant growth. No claim is made that the results given represent the total percentage of Ferrous iron in the rock in its original, weathered and oxidised state.

In conclusion I would like to express my thanks to Mr. H. Trefor Jones, soil chemist at the University of Leeds, for his advice in this section of the paper.

UNSEASONABLE FUNGI

CHRIS. A. CHEETHAM

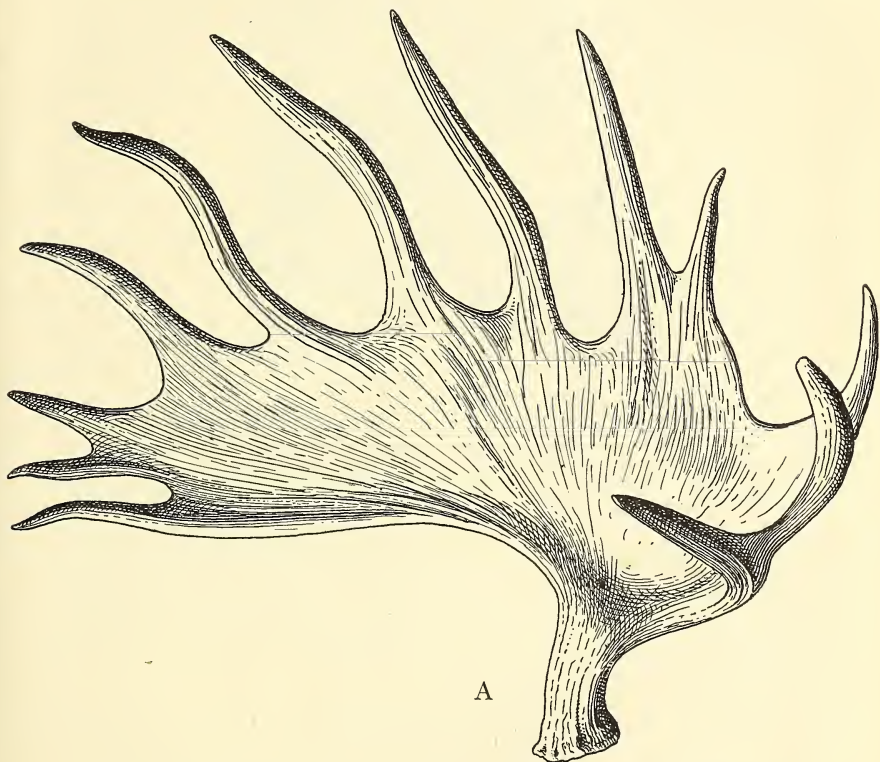
THE open winter had the curious effect of bringing out a third crop of mushrooms for the year 1934. At Austwick we had notes of good gatherings prior to Whitsuntide, next came a good crop at the normal season which was prolonged into November, it seemed as if the plants would require rest but at Christmas once more mushrooms were being gathered in the fields and sold, this continued until the frosts of early January put a stop to them.

Among the species which gave this crop were *Psaliota hæmorrhoidaria* and two species of *Hygrophorus*, *coccineus* and *psittacinus*. These were abundant here at their normal date of September/October and again at the end of December. When the Union held the fungus foray in this district last September the abundance of *Cordyceps militaris* was particularly noted, and this was still plentiful in January. *Clitocybe geotropa*, a species generally found for a short season in October in a habitat under constant observation throughout the year has also given a second crop in January.

THE MOOSE IN EAST YORKSHIRE

T. SHEPPARD, M.SC., F.G.S.

FROM time to time remains of various extinct animals have been recorded in East Yorkshire, and of particular interest is a magnificent antler of a Moose, which rejoices in the scientific name of *Alces machlis*. Fragments of this were



found at Bempton by the late Alexander Boswell, of Thorpe Hall, so long ago as 1839, and eventually came into the possession of the well-known antiquary, the late Thomas Boynton of Bridlington, at whose sale the objects came to the Museum at Hull.

Professor S. H. Reynolds of the University of Bristol, has recently published a volume¹ enumerating the various species of extinct animals found in the British Islands, and in it he illustrates the Hull specimen which, through his help

¹ Palaeontographical Society Memoir. Vol. LXXXVII.

and that of the authorities at the Natural History Museum, South Kensington, has been restored to its original condition. An illustration of this antler before restoration, appears in *The Naturalist* for September, 1920, p. 285. Formerly it was held together by an enormous iron plate which had been put on by the local blacksmith. The specimen is now 2 ft.



8 ins. across, and weighs $12\frac{1}{2}$ lbs. It seems remarkable that a pair of these enormous antlers is grown by the elk and shed annually.

This East Yorkshire specimen is considered by Professor Reynolds to be the finest of its kind ever found, and he illustrates it in his memoir. He has kindly supplied the drawing from which the attached illustration (A) is made. To-day the Moose, or Elk, is a native of Canada. An illustration is also given of the animal as it appeared when alive, with its antlers in position (B).

FIELD NOTES

Gagea lutea near Rotherham.—*Gagea lutea* was discovered in flower on March 7th, near Braithwell, Rotherham. It had previously been found some years ago about four miles distant at Maltby, but had not been seen there for about ten years.—JAMES S. GRIFFITH (M.R.N.S.).

Early Stone-flies in Derbyshire.—Last year (*Naturalist*, July, 1934), I remarked on the late appearance of the early species of Stone-flies in North Derbyshire. This year I find the conditions very different, and some of these insects have emerged at an earlier date than I have previously experienced, earlier even than in 1932. For instance: *Protonemura meyeri* Pict. was seen by the stream in Padley Woods, and

on Blacka Moor, on 22nd January (this species has now occurred with me during every month of the year except December); *Capnia nigra* Pict. was taken by Limb Brook (Ecclesall Wood), on 23rd January; *Leuctra hippopus* Kny, emerged indoors on 12th February, and was seen by Limb Brook on 15th February (6th February in 1932); *Protonemura precox* Mort. occurred on Blacka Moor on 1st March; *Capnia vidua* Klap. in Padley Woods on 13th March (27th February in 1932); and *Nemoura marginata* Pict. in Padley Woods on 26th March. My earliest Caddis-fly was *Philopotamus montanus* Don. taken in Bretton Clough, on 27th March, and at Longshaw on 1st April.—JAMES M. BROWN, Sheffield.

KINGFISHER HAWKING FLIES

JASPER ATKINSON

MR. ERIC HARDY'S paper, 'A Lancashire Birds' Haven' (*Nat.*, February, 1935) was most enjoyable; its only fault was its brevity.

The kingfisher episode particularly interested me as it so nearly corresponds with an experience of my own.

It was on a small private pond in N.W. Leeds, which has a stone containing-wall round part of it. A flight of ducks evidently intended to settle, so I hid myself. Down they came close to me, and then a kingfisher alighted on the wall edge within some five feet of me. Keeping quite still I watched it fly out for some twelve or fifteen minutes evidently hawking flies, and returning to the same perch within a space of two or three feet, in a manner exactly like a spotted flycatcher.

A CEMETERY OF RATS

E. G. BAYFORD

IN the course of making alterations in some business premises in Barnsley, an arched recess in the wall which had been covered over for many years was disclosed. Very probably it had doors at one time and been used as a cupboard. The recess still contained the original shelves, and on the bottom one, which measured thirty inches by ten inches, there was a fairly solid layer of debris four inches deep, consisting entirely of the bony remains of rats. The skulls and vertebrae were almost indistinguishable, but the legs, and more particularly the feet, were well preserved. From these data it will be readily seen that these remains represent an immense number of animals, who had evidently retired there to die, a large hole in the far corner of one side giving access to the retreat.

I have read of elephants having this habit, but cannot call

to mind a similar one in rats. In any case the occurrence is so unusual that it seems worthy of being placed on record. The date when my attention was called to this strange sight was January 23rd, 1935.

NOTES ON MANX LEPIDOPTERA, 1934

W. S. COWIN

SPRING butterflies were again on the wing well in advance of the average date for their appearance. The Small Tortoiseshell (*Aglais urticae*, L.) was seen by Mr. H. S. Cowin on March 25th, the Small White (*Pieris rapae*, L.) appeared on April 8th, and the Green Veined (*P. napi*, L.) was seen on the 30th of the same month in West Baldwin.

Migrant butterflies seemed scarce or absent. I did not see a single Clouded Yellow or Painted Lady, while the Red Admiral (*Vanessa atalanta*, L.) was both late and scarce. On the other hand, the Peacock (*Nymphalis io*, L.) was commoner than I have ever seen it, and appeared in several places away from its usually restricted haunts.

As early as August 9th, several Small Tortoiseshells entered our house and took up hibernating quarters in the bedrooms where they remain to this date.

Among moths, the immigrant Silver Y (*Plusia gamma*, L.), was first seen over valerian, at Douglas, on June 23rd. In the autumn, these moths, normally crepuscular, were not infrequently seen visiting flowers in the middle of the day. Another Golden Ear (*P. moneta*, Fb.) was taken at valerian, at Douglas, on July 6th. Humming-Bird Hawkmoths (*Macroglossum stellatarum*, L.) were less common than last year, the earliest was taken at Manghold Head, on July 10th.

In July, I discovered a strong colony of Five-spotted Burnet moths (*Zygæna trifolii*) near the Braaid. Previously, the Curraghs were regarded as the only Manx locality for this species.

An Ear moth (*Hydroecia nictitans*, Bork.) taken at Douglas, is a new species for the island but probably overlooked previously.

The following are additions to the micro-lepidoptera of the island :

Botys fuscalis, Schiff. Taken in a marsh at Hillberry, May 30th, 1934.

Ebulea sambucalis, Schiff. One netted in a garden at Douglas, June 16th, 1934.

Dasycera sulphurella, Fab. Several seen and one taken on a fence of wooden palings in Douglas, June 9th, 1934.

Leioptilus lienigianus, Zell. Several specimens of this rather uncommon 'plume' moth came to light at Douglas during the autumn, October 13th, 1934.

NOTTINGHAMSHIRE INVERTEBRATA

W. J. F.

'The Invertebrata Fauna of Nottinghamshire.' Supplement by J. W. Carr, M.A. (Cantab.), F.L.S., F.G.S., F.R.E.S., Hon.F.R.H.S., Emeritus Professor of Biology, University College, Nottingham. J. and H. Bell, Ltd., Carlton Street, Nottingham, 1935.

"THE Invertebrate Fauna of Nottinghamshire," was published in 1916, by Professor J. W. Carr. Since that time a large amount of material has accumulated, and the results of intensive collecting are presented in the supplement now under review. As might be expected, and as was the case with the original volume, the greater part of the book is devoted to the Insecta. Other phyla are comparatively little studied, and the records are somewhat meagre except in the case of the Mollusca, with 120 species now on record for the county, and the Arachnida with 260 species.

In the supplement are recorded seven nematodes and six leeches, the latter out of a total British list of eleven species. No new gastropods are listed but numerous new records are given. Coming to the Insecta, three new species of Collembola are given, bringing the total up to thirty-two, which can easily be much increased by work on the order. There are no new Dermaptera, Orthoptera, Plecoptera or Psocoptera, but two new dragonflies are listed, namely *Brachytron pratense* Mull., and *Lestes sponsa* Hans.

In the Ephemeroptera, are three new species, and in the Thysanoptera six, bringing the latter up to a total of eight only, which is below the probable number in the county. Additions in the Hemiptera number fifty-eight, which brings the total up to 468, a fairly average list except that more work is required in the Aphididæ and Coccidæ. Of outstanding interest is the water bug *Aphelocheirus aestivalis* F., taken by the late Vincent Corbett in the Idle, at Scrooby, in August, 1914. This is a rare species which feeds on water molluscs. There are no new records for Neuroptera or Mecaptera, but in Trichoptera fourteen new species are given, bringing the total up to seventy-nine, including the rare *Apatania muliebris* Mc.L., of which species the male has not yet been discovered.

One new butterfly is noted *Carterocephalus palaemon* Pall., from Wigsley Wood. This insect, the Checkered Skipper, is confined to a few localities, the chief being the large woods of Lincolnshire, Northamptonshire, and Buckinghamshire. It also occurs in Huntingdonshire. Among the moths are eleven new species, giving a total of Lepidoptera of 945.

Forty new species of Coleoptera bring the total up to 1449, which can doubtless be increased as the Yorkshire total is in the region of 2180. Among the beetles may be noted *Phloeopora angustiformis* Baudi, from Sherwood Forest. This insect has occurred in Windsor Forest to Donisthorpe, and in Yorkshire, has been taken at Edlington Wood and Allertorpe Common. *Enicmus consimilis* Mann., reinstated in the British list on a few specimens from Sherwood Forest, taken by G. W. Nicholson, in *Polyporus betulinus* on decaying birch. It has since been taken in Sussex in a similar situation. *Axinotarsus ruficollis* Ol., a local southern species which finds its northerly limit in Nottingham, in Sherwood Forest, *Prionus coriarius* L. Three specimens at Mansfield. A rare large brown southern longicorn, whose larva lives in oak trees, and which has been recorded from Lancashire and Cheshire as the most northerly limit. There is an old record for Yorkshire, in 'Loidis and Elmete,' 1816, 'in truncis arborum, Rarissime.'

The Diptera contribute 121 pages out of a total of 273, and much work has been done in this order since the original list was published, 691 species are added, bringing the total up to 1612. Many new species of fungus gnats (Mycetophilidae) are added to the list, and doubtless many more remain to be discovered. The Cecidomyiidae or gall gnats, offer a field for fruitful research in the county. Among a large number of rare and local species it is difficult to select examples, but the following may be specially mentioned: *Aedes (Ochlerotatus) communis* De.G., and *salinellus* Edw., are two British mosquitoes, only known so far from one locality, each in Nottinghamshire, *Lonchoptera furcata* Flin. No fewer than five males of this species, which are exceedingly rare, have been taken in the county. *Agathomyia elegantula* Flin., a rare Platypezid from Sherwood Forest, is only previously known from Herefordshire. *Xanthandrus comptus* Harr. from Bunny, is a rare syrphid, whose larva feeds on larvæ of Tortricids, and which is widely distributed in the British Isles, but very rare. *Syrphus latilunulatus* Collin. (E.M.M., 1931, 179), a species recently added to the British list, a male of which was taken at Wigsley Wood, by Professor Carr, and a female taken in Gedling Wood, by Dr. Hunter, is thought by Mr. Collin to be possibly the unknown female of this species. *Mallota cimbiciformis* Flin., Epperstone Park, a very rare species with headquarters in the New Forest, and not previously taken so far north. *Pocota apiformis* Schr., two males in Gedling Wood, in 1921. An exceedingly rare syrphid. The larva lives in decayed wood and sap. *Rhaphiochaeta breviseta* Ztt., a female of this rare tachinid from Fiskerton, in 1919, was the only known British specimen till the writer took a male at Ross-on-Wye, in 1931. *Pollenia vagabunda* Mg., added to the British list on two females from Sherwood Forest, and since taken in Somerset. *Lucilia ampullacea* Vill., an uncommon British species added to the list in 1926, from four localities in Nottinghamshire.

The Hymenoptera gives 399 additions, including 61 sawflies, 178 ichneumon flies, 65 braconids, and 39 aculeates. Among the sawflies may be mentioned *Neurotoma flaviventris* Retz, bred from larvæ feeding in tents on Cordon pears, a rare species which occurs on hawthorn, and has been taken at Holgate, York. *Hartigia (Macrocephus) satyrus* Pz., from Woodborough, a rare but widely distributed species, and *Xiphydria prolongata* Geoff., from three localities, a southern species attached to willow and not previously taken so far north. There are many rare species among the Ichneumonidae, especially *Mesoleius ustulatus* Desv., from Martin Beck, the only known male and the second known specimen of the species. Among the Chalcididae may be mentioned *Litomastix aestivalis* Mercet, many specimens bred from larvæ of *Hepialus humuli* at Linby, previously only recorded from Spain. Aculeates worth noting are *Psenulus concolor* Dhlb. from Oxtou Bogs, a very rare species which nests in hollow stems and preys on Psyllidae and *Blepharipus styrius* Kohl. from Beauvale Woods and Oxtou Bogs, a rare but widely distributed species. The very rare aberrant *Trigonalya hahnii* Spin., is recorded from Martin Beck, taken by the late Dr. Corbett, in 1917. Three new species of Chrysididae are listed bringing the total up to eleven or about half the British species.

Among the Acarina are four eriophyids, bringing the total of these gall mites up to sixteen, a number which can easily be greatly multiplied by intensive work.

This supplement, as also the original volume, should be on the shelves of all naturalists interested in the distribution of British Invertebrates. They contain a wealth of information with regard to distribution, habitat, and times of appearance. The original volume may still be obtained from the publishers.

SYNOPSIS OF NOTTINGHAMSHIRE INVERTEBRATA.

Porifera	...	...	...	...	...	1
Hydrozoa	...	...	...	...	...	4
Rotifera	...	...	...	...	...	22
Nemathelminthes	...	...	...	...	...	7
Annelida	...	...	...	...	...	93
Polyzoa	...	...	...	...	...	5
Mollusca	...	...	...	...	...	120
Crustacea	...	...	...	...	...	26
Myriapoda	...	...	...	...	...	24
Hexapoda	...	...	...	...	...	6023
Arachnida	...	...	...	...	...	260
						<hr/>
						6585
Deduct doubtful or erroneous species	...	...	...	...	...	15
						<hr/>
						6570
						<hr/>

GEOLOGICAL NOTES

The Council of the Geological Society of London announce the following awards for 1935 :—

The Wollaston Medal to Sir John S. Flett, Director of H.M. Geological Survey, in recognition of the value of his researches ' concerning the mineral structure of the Earth ' in the realms of Petrology, Palæontology, and Stratigraphical Geology.

The Murchison Medal, together with the sum of ten guineas from the Murchison Fund, to E. B. Bailey, Professor of Geology in the University of Glasgow, for his researches in Stratigraphical and Tectonic Geology, and especially for his investigations into the succession and structure of the rocks of the Scottish Highlands.

The Lyell Medal, together with the sum of thirty guineas from the Lyell Fund, to D. M. S. Watson, Joddrell Professor of Zoology and Comparative Anatomy in the University of London, in recognition of the value of his researches in Palæontology and Stratigraphical Geology, and especially into the evolution of the vertebrata.

The Bigsby Medal to H. H. Read, Professor of Geology in the University of Liverpool, in recognition of the value of his petrological investigations, especially into the rocks of north-eastern Scotland and the Shetlands.

The Balance of the Proceeds of the Wollaston Fund to W. J. Arkell, for his contributions to the knowledge of the stratigraphy and palæontology of the Jurassic rocks of Great Britain.

The Balance of the Proceeds of the Murchison Fund to J. V. Harrison, in recognition of the value of his work on Economic Geology, especially that of Persia.

A moiety of the Balance of the Proceeds of the Lyell Fund to J. J. Hartley, in recognition of the value of his geological work, particularly on the succession of the rocks in the Lake District.

A second moiety to L. R. Wager, for his geological work in the Himalaya, Greenland, Ireland, and the North of England.

RECORDS

THREE YORKSHIRE TACHINIDS

WM. J. FORDHAM, M.R.C.S., L.R.C.P., D.P.H.

AMONG some Tachinidæ kindly determined for me by Mr. C. J. Wainwright are three species perhaps worthy of notice.

Exorista hortulana Mg., Barmby Moor, a female, bred from *Acronycta tridens*, Sept., 1932. This insect was bred from *Acronycta alni* from Wakefield in 1879 by Mr. Porritt and this is the only Yorkshire record. The species is probably common in England and occurs in Notts., but has apparently not been recorded north of Yorks. (New to V.C. 61).

Monochæta albicans Fln., Fylinghall, two females, June, 1931. (New to V.C. 62). A more or less common species which occurs freely in woods in spring. It has been taken by Mr. Cheetham at Austwick and Carperby and occurs as far north as Golspie in Scotland. It has been bred in Somerset from *H. dubitata* and *O. brumata*.

Ptychomyia selecta Mg., Frog Hall, Allertorpe Common, two females, Sept. 5th, 1930. This is not a common insect and has previously been recorded from Allertorpe by Mr. Cheetham in 1927. It has also been bred from *Acronycta psi* at Methley by Mr. Wigin. It is a parasite also of sawflies and is recorded from the gooseberry sawfly at Kirton in Lincs. and from *Trichiocampus viminalis* in Scotland. It is generally distributed in the south of England and is recorded from Notts. and Durham.

NEW YORKSHIRE ANTHOMYIDS

WM. J. FORDHAM, M.R.C.S., L.R.C.P., D.P.H.

AMONG some Anthomyids recently determined for me by the Rev. Alfred Thornley are two new to the county of Yorks.

Helina lasiophthalma Mcq., a female, Fylinghall, 6/31. This species is common in Central and Southern Europe and is well distributed in Britain up to Bavelaw in Scotland. It occurs in Notts. and Durham.

Phaonia trimaculata Bouche, a female, Allertorpe Common, 29/5/30. The larvæ of this species destroy the larvæ of *Chortophila brassicæ* on cabbage. It has been recorded from Cheshire by Wadsworth. Two other interesting species are already on record for the county.

Helina anceps Ztt., a female, Allertorpe Common, 8/24, recorded from Bedale by Cheetham and occurring in Notts. It has apparently not been recorded from further north than Yorkshire.

Helina latitarsata Ringd. (*nivalis* Ztt.), Fylinghall, 6/28. An alpine species occurring in France, Styria, Silesia, Prussia, and the Alps, and recorded from Durham. It has been recorded by Cheetham from Thorn's Ghyll.

COLEOPHORA CROCOGRAMELLA ZELL. IN EAST YORKS.

In September, 1934, Mr. T. Sheppard, of the Hull Museum, sent me a larva of *Coleophora crocogramella* Zell. which he had received from Miss Spink, of Hunmanby. The larva in its case looked like a piece of animated cotton wool, the case being made of the woolly material on the leaves of the garden plant, 'Lamb's Ear' (*Stachys lanata*). The specimen was found on the kitchen table, having evidently been brought in from the outside. It is given in Meyrick's Handbook (2nd edition), but was confused with *C. lineola* in the 1st edition. Meyrick gives *Stachys* and *Ballota* as the food plants. I am indebted to Mr. K. G. Blair of the British Museum, for kindly identifying this insect for me.—W.J.F.

REVIEWS AND BOOK NOTICES

A Seashore Calendar, by **L. R. Brightwell**, pp. xii+230 and 68 line drawings. Nelson 6/-. Now that inland folk can and do get to the seaside by car at any time all the year round, a book like this is most welcome, supplying an accurate account of what may be looked for in each of the twelve months. Mr. Brightwell writes in an interesting way and shows that the seashore can be as interesting in December and January as in July and August. The drawings are excellent, and are far more useful and informative than many photographs we have seen in books of this kind. The casual reference to the Chough (which the author spells Chuff!), might give a youngster the impression that this rare bird could be seen anywhere where there are cliffs.

Elementary Microtechnique, by **H. Alan Peacock**, pp. ix+200. Arnold, 5/6. Up to the present, all serious microscopists have realised sadly that standard works on microscopical technique are big and usually very expensive. Here is a manual which compresses into its 200 pages not only the best methods of all the great text books, but the writer has brought his own successful experience to bear on the many problems associated with slide-making. The ground covered, and method of presentation may be gathered from some of the chapter headings: Processes of Microtechnique and the principles they involve; Outline of Methods for making microscopical preparations of animal and plant tissues; Outlines of technique; Methods for specific purposes; Uses of stains; Formulæ and Hints. The last three mentioned have a strict alphabetical arrangement which will be found most useful. There are Appendices dealing with Sources and Culture of Material; Preservation of Material; and lastly a bibliography. It is obvious that the greatest pains have been taken to make the book comprehensive and accurate, and we believe it will be warmly welcomed by all who use microscopes whether they be teachers, students, or amateur microscopists.

Our Country's Wild Animals, by **H. Mortimer Batten**, pp. viii+108 and 20 Photo illustrations. The 'Shown' Series, Nelson, 3/6. This is a pleasantly written little book and should interest youngsters with naturalistic leanings, but the title is a misnomer. A dozen common mammals are dealt with, and there are chapters on three species of Deer, the Wild Cat, Pine-Marten, and Polecat, but there is nothing about Mice, Shrews, Voles (other than the Water Vole), Bats, and even the Mole is omitted! On page 76 the author refers to an illustration depicting badger tracks, but the book contains no such illustration. The photographs are very unequal in quality.

Primitive Land Plants, by **F. O. Bower**, pp. 658, 465 illustrations, 30/- net (MacMillan & Co., Ltd.). It is 27 years, since Professor Bower published his book on *The Origin of a Land Flora*, a work which did much to mould botanical opinion and to orientate research on flowerless plants. As a result of the further information now available, Professor Bower has been able to restate his views on the origin and evolution of flowerless plants in the present work, which embodies the results and the outlook of a lifetime of critical enquiry. The plan of the work is simple yet comprehensive. It deals firstly with the characteristic morphological and structural features of each of the large families of flowerless plants, both living and fossil. Secondly, the author discusses the general principles which seem to have characterised the development of such structures as prothallus and sex-organs, the stem and leaves,

the spore-producing organs and the embryos. Finally, he deals with the bearing of his conclusions upon the problem of the origin and evolution of land plants. This bald analysis, however, does justice neither to the wealth of detail with which the treatment is illustrated nor to the lucidity with which the general principles involved are stated. It is difficult to know whether to admire more the mature judgment which has assembled and enriched this work or the youthfulness with which it is written and with which the author has discarded earlier points of view which he can now show to be inadequate. Further, while it is a book chiefly for the student and the morphological botanist, it contains a great deal of general biological interest and much of interest to the general botanist, as for example, the section in which the author points out that the British ferns, though limited in number, are extraordinary in representing almost all the known types. It is certain, in short, that this work will enhance the already great reputation of its author.

Text Book of Biology, by E. R. Spratt and A. V. Spratt, pp. 646, 9/6 net (Univ. Tutorial Press). This is a new text book of general biology dealing with the whole range of the subject and with both plants and animals. It is suitable for examinations up to the University entrance standard. It is necessarily somewhat condensed, but profusely if somewhat diagrammatically illustrated and it seems quite adequate for its purpose. There are however, some statements which are unnecessarily comprehensive, such as 'Only those parts which contain chlorophyll can manufacture starch,' and the reference to 'amine' in the diagram on page 497 is quite unjustified by the present evidence.

Lac and the Indian Lac Research Institute, by Dorothy Norris, P. M. Glover, and R. W. Aldis, pp. 53, price Rs. 2½ (Calcutta). Lac is the resinous matter secreted by the lac insect, *Laccifer lacca*, one of the Hemiptera. While it is now used principally to provide shellac for gramophone records and varnishes, at one time it yielded the lac dye, akin to cochineal. This volume deals with the problems of the cultivation of this insect and its host plants and it may be recommended as a concise and authoritative account of the problems connected with this subject.

The Hake and the Hake Fishery, by C. F. Hickling, pp. 142, 1 plate, and 13 text figures, 3/6 net (Edward Arnold & Co.). This little book contains the Buckland lectures for 1934. It is an entertaining and authoritative account of the natural history of the hake and of the methods of catching this fish. It is in no sense a book for specialists alone and it gives a good idea of the work, laborious and unassuming, which is being carried out in our marine laboratories. The plain fact which emerges, and which was foreseen by Buckland nearly fifty years ago, is that modern intensive methods of fishing are causing serious depletion of the stocks of fish in the sea, and the stage is now reached when supplies must be husbanded, and, if possible, increased by limitations of the activity of the fishermen. This is a book which may be recommended to any naturalist.

Guide to the Fossil Plants in the British Museum, pp. 73, 6 plates, and 45 text figures, 1/- net (The British Museum, Natural History, S.W.7.) This guide to the fossil plants of the British Museum has been prepared by Mr. W. N. Edwards to elucidate the arrangement of the fossil plants exhibited in the Natural History Museum. It is much more than a guide book, for the wealth of specimens available in the

collections makes this, in effect, an illustrated summary of the British fossil floras. As such it may be recommended alike to those interested in the subject and to students. A useful geological time-chart is given for reference. Mr. Edwards may be congratulated on his arrangement and descriptions of the material points.

NEWS FROM THE MAGAZINES

The Entomologist for February contains '*Laspeyresia (Carpocapsa) pomonella* L. Some notes on its life-history in Britain,' by R. Adkin; '*Aberrations of *Arctia caia* bred by F. W. Sharman, Peterborough,*' by E. A. Cockayne; '*Where do "Red Admirals" go to in the winter in England,*' by Brig.-General J. B. G. Tulloch (evidence adduced to shew that the species probably hibernates high up in crevices in big trees); '*A catalogue of the Noctuae of Ireland,*' by Lt.-Col. C. Donovan; '*Notes on certain genera and species of *Papilionidae* (Lepidoptera),*' by F. Hemming; and several notes and observations.

Broadacres (Vol. I, No. 1). A new quarterly journal is being issued by the Yorkshire Council for Agricultural Education and the Department of Agriculture of the University of Leeds, from whence it may be obtained. It deals with matters relating to agriculture and agricultural education in Yorkshire, and it will also contain the results of experiments and trials conducted in the county and at the University farm at Askham Bryan. The first number suggests that this journal will serve a very useful purpose.

The Journal of the Ministry of Agriculture (Vol. XLI, Feb., 1935) contains interesting notes on the Colorado beetle at Tilbury, detailing the measures taken to eradicate this pest, and also on the roosting of starlings, summarising data as to the number and situation of starling roosts in Great Britain. The latter subject is dealt with more fully by B. J. Marples in the *Journal of Animal Ecology* for November, 1934.

The Scottish Naturalist is now to appear under the Editorship of A. C. Stephen, D.Sc., F.R.S.E., and Percy H. Grimshaw, I.S.O., F.R.S.E., F.R.E.S., of the Natural History Department, Royal Scottish Museum. They will be assisted by Professor James Ritchie, M.A., D.Sc., F.R.S.E.; Evelyn V. Baxter, F.Z.S., H.M.B.O.U.; Leonora J. Rintoul, F.Z.S., H.M.B.O.U.; H. S. Gladstone, M.A., F.R.S.E., F.Z.S.; C. H. O'Donoghue, D.Sc., F.R.S.E.; Anderson Fergusson, F.R.E.S.

The New Phytologist for February, 1935 (Vol. XXXV, No. 1), contains articles on '*The critical revision of certain groups of Malvales,*' by H. L. Edlin; '*The differentiation of protophloem in Angiosperm shoots,*' by C. Y. Chang; '*Factors in the development of root hairs,*' by R. G. H. Cormack; '*Non-symbiotic development of seedlings of *Epacris impressa*,*' by E. I. McLennan; and '*Observations on *Fuscladium saliciperdatum*,*' by F. T. Brooks and M. M. Walker.

The Entomologists' Record for March contains '*Wicken Revisited,*' by H. Donisthorpe; '*Contrexeville, Vosges, France, in June, 1934, and Locquignol, Forest of Mormale, France, in July, 1934,*' by Rev. E. B. Ashby; '*Nomenclature. The List,*' by H. J. Turner; '*Collecting at Ry (nr. Rouen), 17th-29th August, 1934,*' by P. C. Hawker;

'Scientific Notes and Observations,' numerous Notes on Collecting, etc.; and supplement 'British Noctuae,' by H. J. Turner.

The Entomologists' Monthly Magazine for March contains 'The Parasites of British Birds and Mammals, III, on some parasites living in the nest of the House Martin (*Chelidon u. urbica* Linn),' by G. H. Thompson; 'Notes on the Passalidae (*Coleoptera*), No. 5,' by W. D. Hincks; 'Notes on the distribution of *Gnypeta coerulea* Sahlb, in Britain,' by J. H. Keys (Devon, Cumberland, Yorkshire, and Scotland); 'A Crabronid (*Hymenoptera*), new to the British list,' by G. E. J. Nixon (*Crabro dives* Lep, from Tulse Hill, S.E. London); 'Additional Notes on *Anomoea antica* Wied, and *Spilographa alternata* Fall,' by G. F. Wilson (*A. antica* from Berberis, Cotoneaster, and Pyracantha, and *S. alternata* from 29 species of Rosa); 'Notes on British Collembola,' by R. S. Bagnall (*Onychiurus caledonicus* from Scotland and Flamborough, Yorks., *O. debilis* from the East Coast, *O. evansi* from Scotland, and *O. scoticus* from Scotland, Durham, and Flamborough, Yorks.); 'New Species and Forms of African *Lycaenidae* (Lep. Rhop.),' by G. Talbot, and several short notes.

The Entomologist's Monthly Magazine for April contains 'New Species and Forms of African *Lycaenidae* (Lep. Rhop.),' by G. Talbot; 'Some Passalidae in the collection of the Berlin Entomological Museum,' by J. R. Dibb; 'Notes on some dimorphic Psocids,' by J. V. Pearman; 'A new Species of Japyx, from Australia,' by H. Womersley, and several shorter notes, including 'Irish Coleoptera; new county records,' by W. M. Crawford; and 'A Beech Tree's Insects and their Parasites,' by C. Morley.

The Entomologist for March contains 'The genus *Scythris*, introducing *S. fallacella* Schlag, a Species new to Britain,' by F. N. Pierce, and J. W. Metcalfe; 'A Catalogue of the Noctuae of Ireland,' by Lt.-Col. C. Donovan; 'Butterfly collecting in Norway,' by L. G. Higgins; 'Notes on new or little known Asiatic Lepidoptera,' by J. H. Watson; 'Indo-Australian *Hesperiidae*; descriptions of new genera, species, and sub-species,' by Brig. W. H. Evans, several notes and observations, and Plate II, *Tinea, cloacella, granella, ruricolella*, and *personella*.

The Entomologist for April contains '*Sidemia zollikoferi* (Freyer),' with plate, by E. A. Cockayne (seven specimens taken in Britain in the autumn of 1934,' bringing the total number of British specimens up to twelve occurring in South Kent and North Devon. Previous captures include a male taken by Mr. Lofthouse, at Linthorpe, Middlesbrough, in 1903, and a male taken by Mr. Wigin, at Methley); '*Hemimene alpinana* Tr. (Lep. *Tortricidae*),' by F. N. Pierce and J. W. Metcalfe; 'Collecting notes on British Lepidoptera, in 1934,' by C. G. M. de Worms; 'A Catalogue of the Noctuae of Ireland,' by Lt.-Col. C. Donovan; 'Indo-Australian *Hesperiidae*; descriptions of new genera, species, and sub-species,' by Brig. W. H. Evans, and several notes and observations, including '*Vanessa atalanta*, *Scoliopteryx libatrix*, and *Triphosa dubitata* hibernating in caves,' by Brig.-Gen. J. B. G. Tulloch.

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AGE AND RATE OF GROWTH OF JUNIPER ON MOUGHTON FELL

A. MALINS SMITH

THE Ecological Committee of the Yorkshire Naturalists' Union is investigating as comprehensively as possible the problems of the Moughton Juniper scrub. One aspect of the matter is the rate of growth of the bushes. From this an estimate of the age of the oldest individuals may perhaps be made with some accuracy. The results here given on these points were obtained by observation and measurement of plants of varying ages and sizes from all parts of the area. The samples were obtained and many of the measurements made on the spot at Easter, 1934. Since then the material has been carefully measured and examined in the laboratory. The facts will be dealt with in the following sections :—

- I. The rate of growth of the bushes.
- II. The estimation therefrom of the age of the oldest bushes.
- III. The irregularity of rate of growth in the same bush.
- IV. The irregularity of growth in space, *e.g.* one-sided growth and incomplete rings.
- V. The growth of the bushes in different parts of the area and on different soils.
- VI. The growth of the bushes in the dead areas, compared with that of the living bushes.
- VII. The growth of shoots attacked by *Gymnosporangium*.
- VIII. The growth of branches as compared with main trunks.
- IX. Seedlings on the drift soil.

I.

The rate of growth of the specimens measured is given in the accompanying graph (Fig. 1). The material for the graph was chosen from the main stems or main branches. The graph will be commented on in various aspects in other paragraphs. Here I wish merely to summarise the actual average rates of growth. The smallest average rate is 0.26 mms. ($\frac{1}{100}$ inch) increase of circumference per year in a plant 12 years old. The quickest rate is 4.04 m.ms. ($\frac{1}{6}$ inch) circumference per year in a tree 70 years old, *i.e.* about 15 times the average rate of the slowest. To set this rate in some comparison with other trees, I may mention that a tree of *Abies grandis* (another conifer) at Murthly, Perthshire, grew from 1852 to 1916 at the average rate of 44 mms. ($1\frac{3}{4}$ inches) circumference

per annum, *i.e.* about 11 times the highest rate for Juniper on Moughton. A well-grown block of oak in my possession cut down at the age of 80 years had a circumference of 91 cms., giving an average increase of 11.4 mms. ($\frac{2}{5}$ inch) per annum, or approximately three times the highest rate recorded for Moughton Juniper. A yew cut down at 66 years had a circumference of 56.6 cms. and therefore an average growth

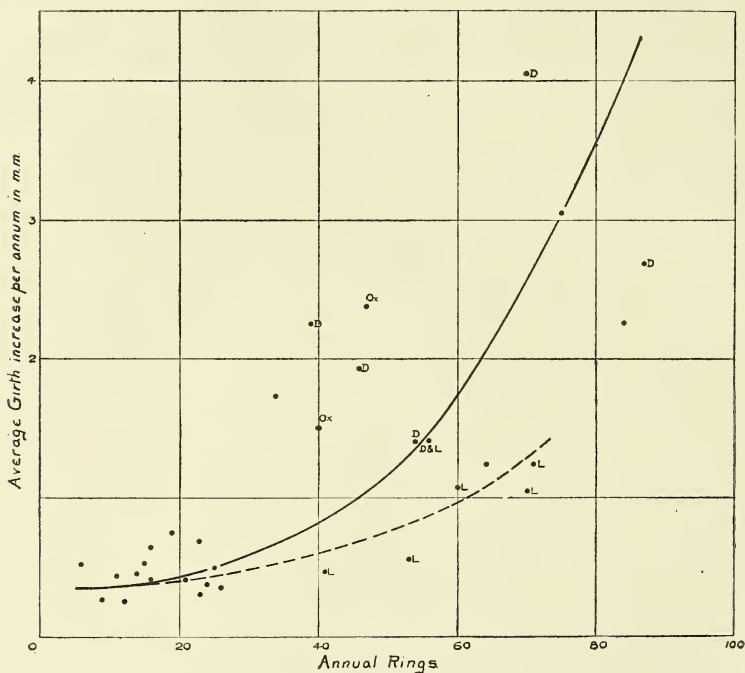


Fig. 1

L=Limestone

D=Drift

Ox=Oxenber

rate of 8.58 mms. ($\frac{1}{3}$ inch) girth per annum or about twice the highest rate for Juniper. The rate of growth of the *Abies* is, of course, exceptionally rapid, it was for this reason in fact that the record of its growth was made. The oak and the yew quoted are both well-grown specimens. If either could grow on the bleak upland and stony soil of Moughton Fell their growth rate would be, no doubt, very much reduced. It must be remembered also that the Juniper is but a shrub, reaching, at its best development in this area, a height of some 10 feet or so. Nevertheless, the rates of growth recorded for certain plants from 10 to 50 years old are excessively slow, and must be attributed in the main to (1) soil conditions, (2) attack by animals, as will be shown.

II.

It is desirable to be able to estimate approximately the age of the oldest bushes in the area. It is presumed that these will be found among the largest, and girth measurements were made of the largest found. The largest measured had a girth of 73.7 cms. (2 feet 5 inches). Others recorded were 66.7 cms., 58.4 cms., 54.6 cms., and 53.4 cms. From the variety of soil conditions and aspect, and the different ages of the trees measured, a growth factor which would apply generally to the trees would seem to be difficult to find. But a near approximation can probably be made. Variety of soil factors is almost eliminated in this calculation, for all the largest trees on Moughton are on the same kind of soil, a drift soil of considerable depth. It is probable that the largest trees have grown at least as fast as the most rapid tree actually

TABLE I.

Stem	Average Increase in Girth per annum.		
	In Early Life.	In Later Life.	Ratio of the two rates.
J	.68 mms. for 30 yrs.	2.29 mms. for 24 yrs.	3.4
A	.35 " " 24 "	0.86 " " 60 "	2.5
M	.95 " " 13 "	2.21 " " 21 "	2.3
F	.97 " " 13 "	1.53 " " 43 "	1.6
B	.92 " " 24 "	1.18 " " 36 "	1.3

measured, *i.e.* approximately an average of 4 mm. increase in girth per annum. Reckoning on this basis the trees above quoted for girth would be 180, 167, 146, 136, and 133 years of age respectively. One comparatively large tree sawn across was 87 years old, with a girth of 23.4 cms., *i.e.* a growth rate of 2.7 mms. per annum. This was by no means a giant and its rate has probably been slower than that of much larger trees in its neighbourhood. We may, however, perhaps take 3 mms. per annum as a possibility for some of these big plants. If so, the five above quoted would be 240, 223, 194, 182, and 178 years old respectively. There would appear, therefore, to be almost a certainty that the oldest tree is under 250 years and every probability that it is under 200 years. It will occur to some that the matter could easily be settled by sawing down one of the biggest trees. This, however, is a matter of greater difficulty than might be supposed. When it is done, it will be interesting to see how far the above calculations are confirmed.

III. VARIATIONS OF GROWTH RATE WITH AGE.

It is very generally the case on Moughton that pieces of the stems which include the earliest years of growth show that the growth in those years was very slow. This period of slow growth may persist in very thin stony soil for as long as 50 years, but many samples show that after 15 to 25 years of slow growth, a change, sometimes gradual, but often sudden, leads to more rapid growth in later years. Table I shows this fact for five specimens of varying ages, and showing the later growth rate from 3.4 down to 1.3 times the earlier growth rate. It is because this increase of growth rate is so general that the average growth rate of all the older trees is greater than that of plants from 10 to 25 years old, a fact which is obvious in the graph.

Fig. 2 shows photographs of specimens J and F from Table I, which illustrate this feature.

IV.

Another very striking feature of the wood of Juniper is the frequency of specimens with one-sided growth and incomplete rings. Fig. 2 gives specimens A, F and K, which show this very markedly. Branches are commonly found which give up growth altogether on one side, usually due to some injury, but which go on growing for years, forming incomplete rings which occupy only one-fifth or one-sixth of the potential circumference. This is one of the features in which the dead wood from certain areas shows the same characteristics as the living. This fact leads to the conjecture that the cause of death may often be serious injury to the cambium by goats or sheep, which perhaps leave the bush to struggle on with partial growth until it finally succumbs and dies. Besides these stems which grow only in a comparatively small portion of the circumference, there are others which at first glance seem complete, but which show on close examination that some of their rings are missing in only small segments of the circumference. In such stems the number of rings along one radius is smaller than that along another. I have always given as the age of such specimens the highest number of rings counted, and this is obviously correct.

V.

A very important fact brought out is the variation of growth rate with the soil. It will be noticed that all the rates which fall below the average as shown by the unbroken curved line of Fig. 2 are of bushes growing on limestone. The soil here is very thin and shallow, and evidently growth is very difficult. It is this which gives to the bushes on certain areas on lime-

stone pavement an appearance of small size and youth. This latter appearance is belied by actual measurements which show that, as in specimen I, a stem with a circumference of just under 9 cms. may be 70 years old, the same, in fact, as one with a circumference of 28 cms. on a more favourable soil. The faster rates of growth are all found on drift soil, which may be anything from 6 inches to 2 or 3 feet in depth. In one pocket in the drift of Juniper Valley, 30 inches of soil was found without coming to the underlying rock, though a depth

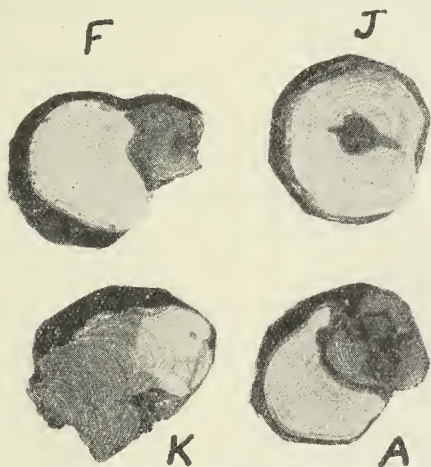


Fig. 2

of 12 to 15 inches was more commonly found. The drift soil is described by Prof. Comber as an ordinary podsol such as would be found over millstone grit. As the name podsol implies, it shows differentiation of layers and infiltration from upper to lower, and a pan has usually been formed in it. Nevertheless, compared with the almost bare limestone rock it is a very favourable soil and all the bushes that attain a good size are found on it. It must be noted in discussing the curve that there are no data for young plants on drift soil, because very striking features of the growth of the Juniper are: (1) the scarcity of any kind of seedling or young plant, and (2) the fact that all the plants below 25 years of age have been found on the limestone. Both these results were already foreshadowed in my report on the Ecology of the Horton-in-Ribblesdale district in *The Naturalist*, Sept., 1930, p. 334. Subsequent search has served to confirm them. The fifteen

plants under 26 years which figure in the graph were the result of intensive search by several observers at each of four visits paid to the area. They are the total number of plants which appeared to be anywhere near seedling stage (and in most cases, as is seen, this appearance was very deceptive). All the visitors on each occasion were asked to keep a look-out for seedling plants, and yet up to the Easter, 1934, visit these fifteen were all that had been found. At Easter, 1934, Miss Wray added three plants (not in my curve) of which I have not had the opportunity to cut sections, but which seemed, from rings of scale leaf sears, to be two of 6 years old and one of 9 years. Up to August, 1934, only one seedling actually in its first year had been found (by Mr. Wattam, under a female bush on a neutral soil). He also found a plant 3 years old, which is not in my curve. Thus, the result of an extensive search on five separate visits by parties varying from four to ten in number, is 15 (in my graph)+3 (Miss Wray)+2 (Mr. Wattam), *i.e.* a total of 20 plants, which though gathered for seedling or young plants, proved on examination to vary in age from 1 to 26 years, and to comprise only one true seedling. Only two of these 20 plants were found off the limestone, and these two not on the acid drift soil, but on a neutral soil between the two. The above facts account for the absence of any young plant records from drift soil. Apparently, there are no such plants on this type of soil. This is, in fact, one of the most remarkable features of the growth of Juniper on Moughton, that at the present time no seedlings are to be found in that type of soil where the Juniper as an adult plant most flourishes, and that all the juvenile plants which are found (and these are very few) are on the limestone soil which, at the best, produces dwarf and stunted adult bushes. I hope to comment more fully on this point at another time. So striking is the general difference between the rates of growth on the two soils that very probably the curve should be represented as two curves, one for drift plants and one for limestone plants. Of these I have indicated the curve for limestone plants only in the graph (Fig. 1). That for drift soil plants only is too incomplete to be indicated. An interesting fact brought out by these measurements is that the specimens from Oxenber come above the average in growth, although they are on limestone. Oxenber is a lower hill and bears woodland to its summit, and in addition some of the Juniper bushes are on a southerly slope. It is probably the more congenial climate, due to its lower elevation, which enables woodland to cover its slopes right to the top and results also in the more rapid growth of the Juniper. Nevertheless, there are some small stunted bushes on the Oxenber limestone, so that depth of soil does play its part, but it seems that wherever on the Oxenber limestone a

deeper pocket of soil is available, the milder climate allows of more rapid growth than on Moughton. The facts brought out in this section are of importance to theories on the possible gradual extension of the Juniper from one area to another, *e.g.* from north-west area toward the south-east, and it is to be kept in mind that a small flattened and stunted bush in one

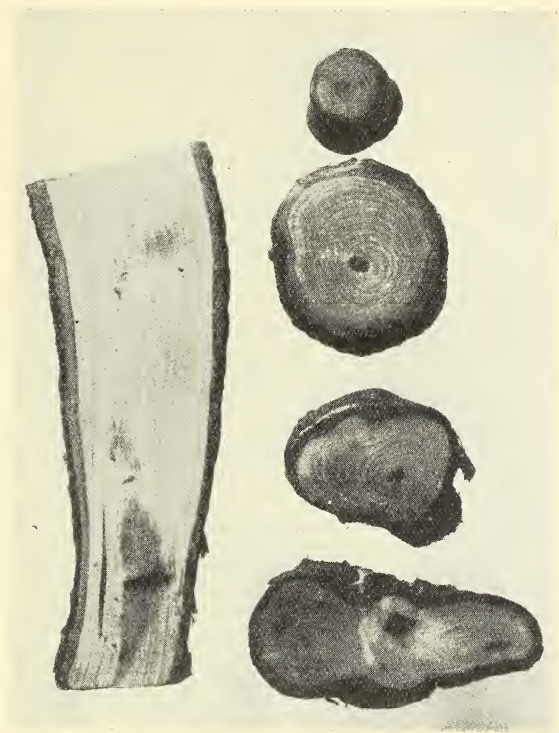


Fig. 3

area may be as old as a large, erect, well-grown bush in another area.

VI.

In certain areas on Moughton the Juniper is all dead and samples of these dead plants were taken for measurement along with the rest. A sample of dead wood was taken also from Oxenber. The chief feature of these samples is that they are similar to the living samples in all respects. Their rate of growth is similar, one-sided growth due to injury is found and, in some, stunted early growth followed by more rapid later growth is seen. There is, therefore, no feature of the growth of the plants in these areas which accounts for their extinction.

From examination of the samples one would think these areas as suitable for growth as those on which the Juniper is still flourishing.

VII.

Among other measurements taken were some across the swellings on the branches due to Gymnosporangium. In a typical specimen (Q) the rate of growth below the swelling (17 years) was 1.30 mms. per annum in average girth, the rate across the swelling (16 years old) was 2.84 mms. per annum, and above the swelling (13 years old) the rate had sunk again to 1.46 mms. per annum. Thus, the effect of Gymnosporangium is to cause the wood to double (approximately) its rate of growth. The bark also is specially thick over the swelling. The attack in this case appears to have begun in the third year, for the first two rings are of normal size, while in the third ring the sudden increase in width is obvious. In another specimen the rate across the swelling is 2.10 mms. per annum (16 years growth), just above the swelling it sinks to 1.47 mm. per annum (15 years growth). In this specimen the attack is first noticeable in the seventh year, the seventh ring being suddenly wider. Thus, the average increase of growth is not so striking as it includes seven years of normal growth previous to the attack. Another attacked branch (H) shows 26 years of normal growth below the swelling at an average rate of 2.23 mms. per annum. Across the swelling it shows 23 years at 3.00 mms. per annum. In this specimen the attack is first seen in its seventh year by the increased growth of that ring. It is interesting to notice that in the thirteenth year this increased growth began to involve a branch which had grown slowly up to that time. From then onwards the branch grew at a more rapid rate on the side next the main stem, and in the nineteenth year the growth rings of the stem and its branch became united and from then onwards formed one swelling. It thus appears that Gymnosporangium first attacks young branches of from 3 to 7 years.

Fig. 3, which I owe to Mr. F. A. Mason, shows on the left a longitudinal section through a Gymnosporangium swelling, and on the right sections of the branch above and through the swelling at levels corresponding to their positions in the figure.

VIII.

It is clear that if, as actually frequently happens, the early growth of a bush is very slow indeed and its later growth more rapid, then the later branches which appear after the plant is thoroughly established and has attained its more rapid rate will show a higher average rate of growth than any main stem, since this average is not diminished by any rings of very slow growth. This was actually found to be the case. In fact, the

highest average rate of growth observed was in an upper branch of a tree on Oxenber, which in 18 years had attained a girth of 10.06 cms., *i.e.* at the rate of 5.6 mms. increase of girth per annum. Other branches showed a rate of 3.47 mms. for 34 years, 1.88 mms. for 26 years, 1.71 mms. for 11 years, all these being much greater than the average growth of the main stem or main branches of similar age. Thus, from another standpoint we come to one of the chief results of the investigation, namely, that it is a common thing for a bush to grow slowly for a varying period at first and then to come into a period of more rapid growth maintained for varying periods. The period which comes to most old trees when the annual rings diminish gradually in size does not seem to be reached in the Juniper; in other words, the cause of death of the bushes is not old age. It seems a probable hypothesis that the general course of slow growth followed by more rapid is due to rabbit attack. The seedling and young trees while small are evidently vulnerable, whereas if once they can reach above a certain height they become immune and can presumably form and maintain many more branches and so increase very much their leaf area for assimilation, with increased general growth. This is supported by: (1) the state of the few young plants found, which almost all showed effects of nibbling; (2) the shape of a great many of the low bushes which have the close-cropped hummocky shape which is presumably due to rabbits. All this shows that rabbit attack is severe and it may account for this feature of the growth of Juniper, as well as for some others which may be discussed in a later paper. In this connection, however, larger animals must not be forgotten. It is an invariable experience on examining the area that one finds large numbers of small twigs in all stages of decay on the ground beneath and around the bushes. Some of these are found partly detached and hanging and they come from parts of the tree quite above the reach of a rabbit. It is, apparently, most likely that these are due to sheep or to goats. They are found on Oxenber where no goats occur, but seem to be more numerous and larger on Moughton where a flock of goats exist as well as the sheep. Why the twigs are rejected as food after being detached it is impossible to say. Anyhow, they bestrew the ground in great numbers, and if this is a process of feeding, then the animals are very wasteful feeders. However, from our point of view, it is clear that the damage done in proportion to the size of the bush is nothing like so great as is done by rabbits to the smaller and lower bushes, and therefore the girth growth rate of the trunk is not checked to anything like the same degree. There comes a time when the larger bushes grow beyond the reach of even these larger animals and then no check is placed upon growth rate by this type of

damage. That this is important is seen by the fact that all the highest measured growth rates are in tall plants and the highest rate of all is in an upper branch of a 10 to 12-foot tree on Oxenber.

IX.

It has been stated above that seedlings have not been found on the drift soil. This is now no longer true, for on August 15th, 1934, I found two seedlings on drift soil in a plot bared of all vegetation at one of our earlier visits (1932). This find is very significant and whatever the fate of these seedlings, it shows that germination can occur if the plant covering is removed. It would seem to follow that the plant covering was less dense, *i.e.* the plant association more open when the present Junipers on the drift established themselves. To follow this conjecture further, however, would lead too far from the main object of this paper.

SUMMARY.

- (1) The growth of main stems of Juniper on Moughton and Oxenber varies from 0.26 mms. ($\frac{1}{100}$ in.) circumference per annum to 4.04 mms. ($\frac{1}{6}$ in.) circumference per annum. This compares with 44 mms. ($1\frac{3}{4}$ in.) in *Abies grandis*, 11.4 mms. ($\frac{2}{3}$ in.) in Oak, and 8.6 mms. ($\frac{1}{3}$ in.) in Yew (picked specimens).
- (2) From the curves of growth rate with age, it is estimated that the largest bushes on Moughton and Oxenber are probably over 170 years and under 250 years old.
- (3) In the majority of stems cut there is shown an increase of growth rate as the plant gets older. This is seen in several individual examples, in the form of the general age-growth curve and in the fact that the most rapid growth rates are in young branches.
- (4) Incomplete rings and one-sided growth are very common.
- (5) The stems of dead bushes show all features similar to those of living bushes, *i.e.* rate of growth, increase of rate with age, and one-sided growth with incomplete rings.
- (6) The average rate of growth is greater on drift soil than on limestone soil, and greater on Oxenber than on Moughton.
- (7) There is a great scarcity of seedling and young plants of juniper, and the few that have been found are on the limestone soil and mostly in the crevices of limestone pavement.
- (8) Gymnosporangium attack causes a marked increase in the rate of growth of the wood and bark of the attacked part. This increased rate in the case of the wood is about double that of the healthy wood.
- (9) No cases of general decrease of growth rate in the later years have been found such as characterise senescent trees of various species. It appears, therefore, that the dead and dying bushes do not die of old age.
- (10) The most probable cause of the slow early growth is rabbit attack. Some effect later may be due to sheep and goat attack, but this is much slighter. The great scarcity of seedlings and young plants may be due to the same cause.
- (11) Seedlings can grow on the drift soil when it is unoccupied by other vegetation.

SNAKES IN ENGLISH LITERATURE

LT.-COL. R. H. ELLIOT

Author of 'The Myth of the Mystic East'

I WAS leaning over the rails in the Reptile House at the Zoo watching an Indian cobra as it twined its sinuous length along the cage floor. I wished to study the graceful movements of the animal with a view to ascertaining exactly how walking is effected in these snakes, when my peace was rudely disturbed by a crowd of small boys and girls 'doing the Zoo' at the run. They slowed down as they read the inscription 'poisonous'; the vision of 'hooded death' hushed even their exuberance, in spite of the thick glass in between them and the snake. Its bifid tongue flickered in and out and broke the spell. 'Arry, look, there's 'is sting; 'ere May, look at 'is sting.' The whole crowd came to see it, and I moved thoughtfully away. Was it surprising they should make the mistake? I called on friends, very intelligent people, and told them the story. My host asked his wife what she thought of it; her answer was: 'But isn't that the sting which goes in and out with a fork at the end?' My host laughed and asked, 'What have you to say now?' Next I spoke of it to a very intelligent and well-read mechanic who takes a great interest in Nature, and he said that until I had taught him better he had thought the same. Lastly, I talked it over with a keeper in the London Zoo and he told me he had watched teachers pointing out the tongue to a class of children and telling them it was the sting. His comment was 'No wonder error spreads when these classes of twenty or thirty children hand on such information in turn to their own families.'

How comes it that many intelligent people are so misinformed? The obvious answer is to be found in our literature. Read the charmingly simple tale which is told at the beginning of the third chapter of Genesis, and the solution of the mystery comes in sight. Biologically, it would be hard to find a less correct story. The writer of the account of Eve's temptation presumably drew his narrative from Babylonian or Egyptian sources. He credited the serpent with being 'more subtil than any beast of the field which the Lord God had made,' and in doing so he helped to set for centuries the ideas of his successors in the compilation of the Hebrew Scriptures. In fact, the same thought runs right through the Bible. Christ, in sending out His Apostles, bids them 'be wise as serpents,' and St. Paul warns the Corinthians lest they should be corrupted 'as the serpent beguiled Eve through his subtilty.' Far from being 'subtil,' the snake is a stupid creature with a low form of brain devoted to sight,

smell and reflex actions, but very poorly equipped, owing to scarcity of fore brain, for the higher functions such as reasoning power, planning and cunning. And yet the serpent has been associated throughout the Bible with the Devil, that personification of superhuman intelligence, deliberately planned evil, master cunning and malice. Nor is this only the case with Christianity and Hebraism. In Babylonian mythology the old serpent goddess was the embodiment of all that was hostile to the heavenly powers. In Egypt the serpent, Apap, played the same role. In Hinduism the gods waged war on the serpent Ahi. In Zoroastrianism we find Ormuzd and Ahriman in deadly opposition to each other. The Hebrew conception of Satan is believed to date from the Exile and to be traceable to Persian sources. Satan is also identified with the serpent in the Book of the Wisdom of Solomon, in the Book of the Secrets of Enoch, and in the Psalms of Solomon.

In one respect, however, the Bible narrative shows some knowledge of biology for the serpent that talked with Eve was obviously a legged animal. Had it been already a 'creeper' the curse 'upon thy belly shalt thou go' would have meant nothing. The writer was clearly an observer of nature. It would seem that the snake he had in mind was a python, for he had presumably noticed the vestigial rudiments of hind legs, one on each side of the vent, and had rightly assumed that here was an animal that once had walked and now had lost the power of so doing. These legs are evidence of the snake's descent from lizards, and, indeed, intermediate grades in their disappearance can now be easily demonstrated. This is well done for the student in the South Kensington Museum. The early enquiring mind had demanded an explanation, and the Genesis account is one of those folk-lore stories handed down through countless generations to explain by mythical means a fact for which the limited knowledge of the time failed to furnish any adequate reason.

'Dust shalt thou eat.' It might have seemed natural that snakes which are so near the ground in all phases of their lives would eat dust and things which lie in it. Isaiah (lxv, 25) said 'dust shall be the serpent's meat,' and Micah perpetuated the same idea in the words 'they shall lick the dust like a serpent.' As a matter of fact, snakes are very clean feeders. Their diet is exclusively animal, but they rarely touch carrion, and after killing their prey, either by the injection of venom or by crushing, they eat it fresh, swallowing it whole. This is well known to all who have watched their habits or have opened up their stomachs after death.

Of the enmity between man and the serpent much might

be written. It may fairly be contended that the Bible has has a great deal to do with the horror, fear, and hatred engendered in the human mind by snakes. Christ had no more powerful epithets of reprobation than 'Ye serpents, ye generation of vipers, how can ye escape the dangers of hell,' whilst St. John the Baptist addressed the Pharisees and Sadducees as a 'generation of vipers.' In Deuteronomy, in Jeremiah, in Amos, and in the first Epistle to the Corinthians we read of God's use of terrible serpents to punish his erring people. The story of the serpent's subtlety and hostility begins with the early chapters of Genesis and culminates in the twelfth chapter of the Apocalypse. We are taught all this in our youth. Is it strange that many of us have a horror of snakes?

Milton's very incorrect filling in of the details of the Biblical story of the Fall has, I think, in its poetic verbosity influenced mankind far more than has the simple Bible narrative. His biology is sadly defective. The snake which

'Bow'd his turret crest, and sleek enamell's neck'

was certainly drawn from a python. Falling into the Genesis error, he describes it as

'Subtlest beast of all the field'

and then he goes on to label it

'The wily adder, blithe and gay.'

Milton's serpent, however, did not walk on legs,

' . . . but on his rear
Circular base of rising folds, that tower'd
Fold above fold a surging maze, his head
Crested aloft, and carbuncle his eyes;
With burnished neck of verdant gold, erect
Amidst his circling spires, that on the grass
Floated redundant: pleasing was his shape,
And lovely.'

A magnificent picture of a huge snake, but tainted by Milton's futile guess as to its mode of progression before the curse. He had clearly failed to grasp the significance of the vestiges of hind limbs. He may never even have heard of them, for it seems he did not know the difference between the small deadly adder and the 'Huge Python,' to which he later compares Satan, a giant amidst smaller fellow-snakes. It will be suggested that when Milton spoke of the adder he was thinking of the old English word 'naedre,' a serpent, but he surely must have known the adder well, though how anyone could speak of it or of any other snake as 'blithe and gay' passes my comprehension. When the tempter

approached Eve he did so in true serpent-gliding fashion for

' . . . she busied, heard the sound
Of rustling leaves, but minded not, as used
To such disport before her through the field,'

Again, when she bids him take her to the fatal tree,

' . . . He leading swiftly roll'd
In tangles, and made intricate seem straight,'

Then, after Eve had fallen,

' Back to the thicket slunk the guilty serpent.'

a happy way of expressing how a snake glides into the undergrowth. Milton's fanciful description of the scene in which Satan and his followers were later transformed by the dropping of their limbs into hissing snakes is unworthy of the simple dignity of the Bible narrative and falls to the level of the modern novelist's picturesque and absurd snake-stories. Milton shares another Genesis error when he makes the serpent an eater of dust. It may seem hypercritical to demand biologic accuracy from a poet, but Milton's outstanding position has made it all too easy for him to propagate error, which he certainly did.

To return to the fallacy of the serpent's sting. The *Lesser Oxford Dictionary*, in its definition of a 'sting,' includes the following: 'The wound inflicted by the aculeus of an insect, the telson of a scorpion, the fang of an adder, etc.' With every deference for so distinguished and valuable a work, I venture to think that this definition contains a serious error inimical to correct thinking on the subject of snake-bite. We should clearly distinguish from stings, the bites of animals inflicted in vertebrates by their teeth and in invertebrates by modified jaws. The bee and wasp convey their poison through a modified ovipositor; the scorpion through the telson or last joint of the tail, and nettles and jelly-fish through special stinging cells which clothe their surface. The rays and certain other fish inflict poisonous wounds by the agency of special spines, sometimes situated at the base of the tail. How far they are fed with a specific poison is a matter of dispute. The mosquito bites by the aid of modified mouth-appendages and injects a poison in so doing; so does the leech. The horse-fly is content to bite, but does so severely. The spiders have a venomous bite and so have the centipedes. The jaws in all these invertebrate animals which inflict poisonous bites are connected with definite poison-glands. The natives of India believe, and I think correctly so, that not only the jaws of centipedes, but all, or at least many, of the legs are provided with stinging power. At any rate, I

have seen two long lines of inflamed points on the skin of a centipede's victim. The animal had been disturbed whilst crossing the face or limb of a sleeper. These are merely a few facts from which it will be obvious that to define a sting is a difficult matter, but, and here I join issue with the Oxford Dictionary, it is incorrect and illogical to select the adder to the exclusion of other snakes, for it bites just like all the rest do, whether they are colubrine or viperine.

It is of interest to seek the source of this confusion. Proverbs (xxiii, 32) says of wine, 'At the last it biteth like a serpent, and stingeth like an adder.' Here a distinction is obviously drawn between the adder and other snakes. Nor is this all, for the Bible lends support to the idea that a snake stings with its tongue. Psalm cxl, verse 3, says 'They have sharpened their tongues like a serpent; adders' poison is under their lips.' Again in Job (xx, 16) we read 'The viper's tongue shall slay him.'

Turning now to Shakespeare we find the same idea running riot. We must remember that the adder is the one poisonous British snake and that the great poet was probably well acquainted with the country lore about it. At least ten times, and that in seven different plays, he speaks of 'the serpent's sting.' In these references the adder is three times specifically mentioned. There are also numerous allusions—at least six—to the dangers of the snake's double or forked tongue. A characteristic reference is found in 'Richard III' (Act III, Scene 2). 'A lurking adder whose double tongue may with a mortal touch throw death.' At least four times it is the adder whose double tongue is accused.

When two such great exponents of the English language as the Bible and the works of Shakespeare have led the way so clearly, it is not surprising that the Oxford Dictionary should follow suit, but I submit that it would have been better not to follow even such excellent authorities when they traverse what are now well known to be the biological facts of the case. No snake stings with its tongue; that organ is a sensory apparatus, probably closely connected with smell. All the venomous snakes alike bite by means of grooved or hollowed teeth connected with modified salivary glands which secrete and store up poison in special sacs adapted for the purpose. There is no essential difference in this respect between the adder and the cobra, the mamba, the rattlesnake, or, indeed, any other serpent.

Spenser and Dryden fall into the same mistake about the serpent's tongue, and it is also shared by some classical writers, including Ovid and Virgil.

As to the serpent's disposition, Shakespeare closely follows the Bible, as shown in Lady Macbeth's advice to her husband

to 'Look like the innocent flower, But be the serpent under't' (Act I, Scene 5). Or again on Juliet's lips, 'O serpent heart hid with a flowering face' 'Romeo and Juliet' (Act III, Scene 2). Many other references of the same nature might be quoted. Nothing was too bad for Shakespeare to say of the snake. He is again far from happy when he refers to the asp that bit Cleopatra. When those around were seeking for the cause of her death, the guard finds the basket in which the snakes had been surreptitiously brought into her room and says 'This is an aspic's trail: and these fig leaves have slime upon them, such as an aspic leaves upon the caves of Nile.' Even the ordinary land snake is not slimy; its coat is like dressed leather in feel, whilst the African adder which the Queen used for her suicide is a very dry scaly animal, never moist, but on the contrary, harsh to the touch. Byron and Chatterton make the same mistake, and the public share it very extensively; indeed, if asked to handle a snake, many people will say that they 'don't want to touch the slimy thing.'

Another widespread fallacy is in connection with the handling of serpents by privileged people. It is usually thought that the Indian snake-charmers are immune to the bites of their charges. I have shown elsewhere (Blackwood, March, 1933) that these men owe their immunity to the careful way they handle snakes and to nothing else.

Christ in sending forth the seventy said, 'I give you power to tread on serpents and scorpions' (St. Luke x, 19), and again after His resurrection, in speaking of the signs that should follow 'them that believe,' He said amongst other things that 'they shall take up serpents' (St. Mark xvi, 18). St. Paul shook off the viper that fastened on his hand and was unharmed, a quite possible happening under certain circumstances (Acts xxviii, 3). There are other promises of the same kind in the Scriptures, but I need not labour my point. Professor Seligman, in his B.B.C. address (9.2.34), quotes the recent case of an Egyptian Rifa'i bitten by a venomous snake. This man had the utmost confidence that his saint would save him, but he died none the less. In the same category would come the local preacher whom I mentioned in Blackwood (December, 1934). He is said to have taken a rattlesnake into the pulpit and afterwards nearly died from the bites which the reptile inflicted.

Cardinal Pandulph, the Pope's legate, speaks to King Philip of 'holding a serpent by the tongue' as one of the rashest acts imaginable ('King John,' Act III, Scene 1), and yet Antonio boasts that he dare do this very thing ('Much Ado About Nothing,' Act V, Scene 1). Going away back to mythology we may recall that when Hera sent two serpents

to destroy the infant Hercules, the latter strangled the pair, thus making a somewhat dramatic entry on the world's stage. References to this achievement are to be found in 'Love's Labours Lost' (Act V, Scenes 1 and 2).

Shakespeare probably reaches the climax of biological error in his reference in *Timon of Athens* (Act IV, Scene 3) to the slow-worm which he describes as 'The eyeless venomed worm.' It is not a worm, but a legless lizard. It is not blind, but has very good sight. Like other lizards (and unlike snakes) it has active eyelids. It is not 'venomed,' having no fangs and no power to inflict a poisonous bite. It would be difficult to crowd more error into three words. Nor is he more happy in including a 'blind-worm's sting' among the ingredients of the Witches' Caldron, for the animal has no sting as well as no venomous bite. Herrick was equally at sea when he wished 'Nor snake nor slow-worm bite thee'; and so was Scott when he described the animal as 'slimy'; he wrote 'There the slow Blind Worm left his slime'; another category of errors, for though the slow-worm lies very still to avoid notice, it can move fast enough when it wants to do so. As already said, it is not blind, is not slimy, and is not a worm. Surely there is more error with regard to snakes than to any other creatures, and that amongst the most intellectual people of many centuries.

The Psalmist speaks of 'the deaf adder that stoppeth her ear; which will not hearken to the voice of charmers, charming never so wisely.' Snakes are all deaf. They have no ears except some buried rudiments of what were once ears. They appear to rely on vibrations through the ground reaching them by their rib-tips. There is, however, a distinction in disposition between the surly adder and the comparatively gentle colubridæ. Shakespeare alludes more than once to the deafness of the adder, but does not mention that it shares this defect with other snakes. In this he follows the Bible. It must be remembered that the adder is the only poisonous British snake and probably the poet's acquaintance with other venomous species was very much restricted.

The words Shakespeare puts into King Lear's mouth, 'How sharper than a serpent's tooth, it is to have a thankless child,' always awakens a keen response in my memory, for when my thumb was transfixd on a Russell viper's fang the point was so sharp that I scarcely felt it and only realised my danger when I saw the tooth erect and blood oozing from where the puncture had been made.

Shakespeare's warning that 'It is the bright day brings forth the adder, And that craves wary walking,' and his words of caution against flowery and sun-kissed banks are all too

true, provided one remembers he is speaking of the spring-time mating days and not of the heat of late summer which drives the reptiles to seek refuge under moss and bracken except after a sharp shower of rain. In 'Antony and Cleopatra,' Antony discusses the crocodile with Lepidus, who says ' 'Tis a strange serpent,' and Antony replies, ' 'Tis so, and the tears of it are wet.' This is an interesting remark, for whilst the crocodile sheds external tears, the snake's tears pass down inside the immovable scale which covers the eye into the mouth. The distinction, therefore, between the snake and the crocodile is scientific and quite beyond what one would expect of the poet.

Many other writers might be quoted, but one European at least cannot be altogether left unnoticed. In Dante's 'Hell,' Canto XXV, we read of a serpent with six feet, one pair of which held the victim down by the arms, another by the thighs, and a third grasped the belly, while it buried its fangs 'deep in either cheek' of its prey. No normal vertebrate has ever developed more than two pairs of limbs, fore and hind respectively. Dante was allowing his imagination to run away with him, influenced by the number 3. It is reminiscent of the seraphims of Isaiah, each one of whom had six wings. 'With twain he covered his face, with twain he covered his feet, and with twain he did fly.' Similar many-limbed animals occur in the Jewish writings of post-captivity date, and were presumably borrowed from carvings in the ancient temples of Babylon.

I have kept mainly to English literature and have abstained from anything but occasional references to other classics. This does not mean that the subject is not abundantly dealt with by many of the old pagan writers, for they have much that is of value to tell us. Indeed, there are few people to-day who could not learn a great deal about snakes from Aristotle, that wonderful observer of Nature. In his writings one does not find any of the wild and fanciful stories to which I have been alluding. The anatomy and the ways of reptiles have not changed since he wrote, and much of his snake-lore would find a place in any modern text-book on the subject. This great difference between the sacred and the profane writers is extraordinarily interesting; however, that is another story.

THE BRITISH TRUST FOR ORNITHOLOGY.

E. M. NICHOLSON

YORKSHIRE naturalists have long recognised the value of co-operation in field work, as the meetings and expeditions recorded in this journal show. The most confirmed individualist must contribute to and draw from a common stock of ideas and experience, and in field ornithology there are many problems which cannot be properly tackled except by a team. Occasionally some courageous man will face single-handed tasks which in other countries are left to the resources of the State—Dr. Collinge's pioneer work on economic ornithology is a case in point—but on the whole it is true to say that several of the most important ornithological problems are not tackled and cannot be tackled while observation remains on a more or less individualist basis. This does not, of course, imply that individualism is to be condemned; on the contrary, its value is obvious. But team work is complementary to individual effort, and both are essential to the future of ornithology.

It was in this conviction that a number of ornithologists, including Mr. H. F. Witherby, President of the B.O.U., Rev. F. C. R. Jourdain, Professor Julian Huxley, Lord Scone (now Earl of Mansfield), Mr. A. W. Boyd, Dr. W. E. Collinge, Dr. P. R. Lowe, Mr. N. B. Kinnear and others agreed to form a British Trust for Ornithology which was intended to act as a permanent trustee on behalf of British field ornithologists, to secure and preserve collections of notes, MSS., photographs, books, papers and so forth which have hitherto been liable to dispersal or destruction for want of any permanent agent to protect them, and, above all, to raise funds and build up resources which could be used to make available for all bird-watchers certain services of information, and (on request) of guidance.

It was an ambitious plan, launched in the depths of the worst depression of a century, and some years yet will be needed to show how far it can be reckoned successful. All the same, anyone who reads the First Report of the Trust, just issued, can hardly escape the conclusion that the basic conception is sound, and that the usefulness of the experiment has already been demonstrated over a wide field. One of the completed inquiries, in which Northern ornithologists took the most conspicuous part, was a survey of breeding swallows in order to discover their numbers on sample areas in relation to house-martins, their association with domestic animals at the breeding place, their fertility and the mortality of broods, and their parasites. Another inquiry of considerable Northern interest was a study of heathland and moorland bird communities, while another dealt with the fortunes of

short-eared owls breeding during a vole plague on the Border, and yet another, promoted by a member of the Midlothian Bird Club, undertook to survey the astonishing spread of the fulmar petrel as a breeding bird in the British Isles. A further experiment is the compilation of an annual index of heron numbers, which is expected to record faithfully fluctuations in the breeding heron population of England and Wales. The importance of such an index will be apparent to readers of *The Naturalist*, which recently printed correspondence describing a pioneer and successful attempt in Yorkshire to apply to bird protection policy conclusions arrived at from census work on the heron.

The Trust exists to fill a gap and is not competitive with any existing organisation, either nationally or locally. It has, for example, been asked by various ornithological societies, which select annually a particular group of species for intensive study, to undertake co-ordination so that as many as possible may concentrate on the same birds in the same year. The species chosen for the current year are the pochard, redstart, and greater spotted woodpecker, and several societies are working on these. Collaboration is also being secured with animal and plant ecologists, with parasitologists, with entomologists and other neighbouring branches of science.

At present the field work is being directed from a temporary centre in the University Museum at Oxford by Mr. W. B. Alexander, M.A., M.B.O.U. It is hoped shortly to establish a permanent Institute of Field Ornithology in the neighbourhood of Oxford, and under the auspices of the University, which already recognises and is administering the scheme. Owing to shortage of funds, of space, and of paid help, many things which are obviously desirable cannot at present be set in hand, and had it not been for the generosity of a number of ornithologists and the exceedingly enthusiastic response of field observers the progress which has already been made would not have been possible.

During the critical early years of its development the Trust is doing its best to take up a national standpoint, and its success in building soundly must to a large extent depend upon the understanding of its possibilities, the constructive criticism of its efforts, and the support of its work by Northern naturalists.

[EDITORS' NOTE : Ornithologists and others interested in the field-work indicated are invited to communicate with Mr. W. B. Alexander, M.A., University Museum, Oxford, and general correspondence and enquiries should be sent to Mr. E. M. Nicholson, Hon. Secretary, 61 Marsham Street, London, S.W.1.]

YORKSHIRE PLANT GALLS.

I AM anxious to enlist the help of readers of *The Naturalist* and members of the Yorkshire Naturalists' Union in collecting the records of the Plant Galls that have been found in Yorkshire, especially the records that have appeared in periodicals or transactions other than *The Naturalist*. At present I am asking for records up to 1881 inclusive. In *The Naturalist* for this period there seem to be references to two galls only, and even these are rather indeterminate. As long ago as March, 1878, Mr. S. L. Mosley said, 'We want to know more of Yorkshire Gall Insects.' I should be glad to have help in collecting information.—W. P. WINTER, 6 Grange Avenue, Saltaire.

RECORDS

MACROSIPHUM HELLEBORI. THEOB. AT WENTBRIDGE.

DURING a visit to the Woods on January 21st, 1935, I found *Helleborus foetidus* L. in bloom and was surprised to see an aphid very active and abundant on the plant, especially on the flowers. Snow fell on January 26th and was on the ground for nearly a week, and on February 5th there were no visible signs of the aphid on the Hellebore. Unfortunately, I was not able to revisit the place until April 13th, when the aphid was again very abundant. I sent a specimen of the plant on which the green fly appeared to Mr. Frederick Laing, of the Entomological Department, British Museum, on April 14th, and to whom I am indebted for the following information:—

'It is, of course, *Macrosiphum hellebori* Theobald, that is to say that there is no doubt about its being that species. From my point of view, however, it is *M. gei*, Koch (*solani-folii*, Ashm.). I regard the latter species as polyphagous, and composed of a number of forms showing minute differences and all intergrading into one another. In expressing the view that it is *gei*, Koch, I am quite well aware that many perfectly competent aphidologists would disagree with me.'—ELSIE M. MOREHOUSE.

NORTH CUMBERLAND HETEROPTERA.

ABOUT one-fourth of the County of Cumberland lies to the north of the River Eden, and very little has been done at cataloguing its insect inhabitants. I have taken the following Heteroptera in that area. *Picromerus bidens* L. occurs at Todhills on Broom in September. *Elasmucha grisea* L. and *Elasmotethus interstinctus* L. both occur at Todhills on Birch in autumn, and both are rather rare. On and about Todhills Moss I have taken *Scolopostethus decoratus* Hahn., *Acomphocoris pygmaeus* Fall. (common on Scotch Fir), *Lygus*

lucorum Mey., *Monalocoris filicis* L., *Charagochilus gyllenhali* Fall. (uncommon, by sweeping long grass in June), *Orthotylus marginalis* Reut. and *O. ericetorum* Fall. (common on heather). About Hallburn I met with *Nabis rugosus* L., *Stenodema lævigatum* L. and *S. calcaratum* Fall., the last one of our commonest species. From near the Clift Bridge I have *Anthocoris nemoralis* Fab. and *Liocoris fripustulatus* Fab. From the Netherby district I have *Anthocoris confusus* Reut., *A. nemorum* L., and *Lygus pratensis* L. Near West Linton I swept *Stygnocoris rusticus* Fall. rarely and *S. pedestris* Fall. in abundance. From Blackford I have *Plagiognathus arbustorum* Fab. and *P. chrysanthemi* Wolff.—JAS. MURRAY, Gretna.

QUAIL IN YORKSHIRE.

I HAVE had several instances brought to my notice of quail this winter, the latest being six, or more perhaps, feeding on some weed-covered derelict ground at Aislaby, near Whitby, on December 8th, 1934. They were observed by Mr. A. S. Frank, of Egton Bridge, Yorks.

They have also been reported in Northamptonshire and Lincolnshire this winter.—CHAS. F. PROCTER.

REVIEWS AND BOOK NOTICES

A History of the Birds of Middlesex, by William E. Clegg, F.L.S., M.B.O.U., pp. xxxii+245, with 6 plates and a map. Witherby, 18/-. Ornithologists who know Mr. Clegg's volume on the Birds of Essex will welcome this most valuable contribution to the literature of their subject. The book is a model of what a county ornithology should be. The area dealt with, although small, is a difficult one, as it includes a large part of London and its growing suburbs. A concise and well-written introduction deals with geology, ecology, migration, protection, literature, and special reference is made to the large numbers of reservoirs and sewage-farms in the county. Each species is dealt with in much detail, and following a discussion of the past and present status of the bird is usually to be found a note on its British economic status, based on Dr. Walter Collinge's work. The Bibliography is most extensive, containing over 1300 items. These are numbered, the numbers relating to any one bird appearing at the head of the appropriate article. The plates are well-chosen and the map is clear and helpful. Both the author and the publishers deserve the thanks of all British ornithologists for the production of a valuable and indispensable work of reference.

Adventures with Animals and Men, by Cherry Kearton, pp. xvii+292, with 44 photographs by the author. Longmans 12/6. This book is based on Mr. Kearton's forty years work and adventure as a photographer of wild life. North country naturalists do not need reminding that the Kearton brothers hailed from Swaledale in North Yorkshire, and from early youth took a serious interest in natural history, inspired by their father, himself a keen naturalist. Cherry Kearton was born in 1871, and took his first nature photograph in the late 80's. From that day to this his life has been one of grand adventure and in this book he tells of his doings in a way that will thrill the reader. He

has the rare knack of recalling a dangerous incident so vividly and yet with no excess of words that one seems to take an actual share in the risks involved. Even the less exciting doings recorded are full of interest, and one is brought to realise the enormous amount of patient work which has to be put in before a really good wild life photograph can be taken. Kearton cinematographed London from the air as far back as 1908, and his film was a great success. Incidentally the airship came to grief, but Kearton with his usual luck escaped with hardly a scratch. For thirty years he has been filming all sorts of creatures all over the world, except for an interlude as a war correspondent in Belgium. He is still producing films of animal life and one which is being shown in the cinemas this year follows the book very closely.

NEWS FROM THE MAGAZINES

The Transactions of the Northern Naturalists' Union, Vol. I, Part 3 (1934), contains 'A Survey of the Land and Freshwater Mollusca of Northumberland and Durham,' by E. Percy Blackburn; 'Prehistoric Invasions of Northumberland and Durham,' by A. Raistrick and G. Bennett Gibbs; and 'Concerning British Analgidae (Feather Mites),' by J. E. Hull.

The Essex Naturalist, Vol. XXIV, Part 5 (October, 1934, to March, 1935), contains a number of important articles, which include: 'The History of Essex Heronries,' by William E. Glegg; 'Some New Fungi from Epping Forest,' by Arthur A. Pearson; and 'The History of Mycology in Essex,' by J. Ramsbottom.

British Birds for May concludes Volume XXVIII, which contains many important contributions to ornithology. Recoveries of marked birds are becoming more and more frequent as is indicated by the number of records during the year. Further additions and alterations to the British List of Birds are recorded. The additions are:—5A, 'The Scandinavian Jackdaw, *Coleus monedula* (L.)'; 373A, 'The Arctic Ringed Plover, *Charadrius hiaticula tundræ* (P. R. Lowe)'; 443A, 'The Bridled Tern, *Sterna anæthetus* (Scop.)'. Newly-described British subspecies are: 20A, 'The Hebridean Twite, *Carduelis flavirostris bensonorum* (Meinertz.)'; 187A, 'Hebridean Stonechat, *Sexicola torquata theresæ* (Meinertz.)'; 200A, 'The Hebridean Hedge-Sparrow, *Prunella modularis hebridium* (Meinertz.)'. The List Committee of the B.O.U., acting on the priority rule, has decided on a further change in nomenclature of the Song-thrushes. These are as follows:—166, 'Turdus ericitorum philomelus Brehm., The Continental Song-Thrush'; 167, 'Turdus ericitorum ericitorum Turton, The British Song-Thrush'; 168, 'Turdus ericitorum hebridensis Clarke, The Hebridean Song-Thrush.' The British List now includes 514 forms.

The Entomologist for May contains 'Phthorimæa obsoletella F.v.R., and an allied species,' by F. N. Pierce and J. W. Metcalfe (*P. seminella* sp.nov., from larvæ on *Chenopodium* and *Suaeda*); 'Collecting notes on British Lepidoptera in 1934,' by C. G. M. de Worms; 'The small orange *Colias* (Lepidoptera, Pieridae) from the Sikkim-Thibet Himalayas,' by Brig. W. H. Evans (with plate of *Colias miranda* and *C. dubia*); 'Cryptophagus stramenti n.sp. (Cryptophagidae Col.), a species of Coleoptera new to science, and a note on *C. umbratus* Er. and *C. distinguendus* Stm.,' by H. Donisthorpe (Windsor Forest, in hay and straw refuse); 'Three new Melitæid Butterflies from Asia,' by L. G. Higgins; 'Coleophora erigerella nov.sp.,' by L. T. Ford (on seed-heads of *Erigeron acre* at Dartford Heath, and near Gravesend, Kent); and numerous notes and observations.

The Entomologist's Monthly Magazine for May contains 'Remark

on the name of *Boriomyia nervosa* Fabr.,' by K. J. Morton ; '*Anthonomus rufus* Schon. (*Curculionidæ* Col.), a beetle new to Ireland,' by H. Donisthorpe (Killarney on blackthorn, bloom, in England only taken near Hastings) ; 'Two new species of Australian *Elateridæ* (Col.),' by K. G. Blair ; 'Some synonymic notes in the family Tenebrionade (Col). K. G. Blair ; 'A note on some British species of *Halictus*,' by R. C. L. Perkins ; 'Notes on Wasps, IV,' by G. E. J. Nixon ; 'New species and forms of African *Lycanidæ* (Lep. Rhop.),' by G. Talbot ; and several shorter notes including 'Hemiptera—Heteroptera in 1934,' by E. C. Bedwell.

The *Journal of the Ministry of Agriculture* for April (No. 1 of Vol. XLII) contains, among other items of interest, an article on 'Control of the Cabbage Root Fly' and one on 'Birds in Relation to Agriculture.' The latter, by F. Howard Lancum, F.L.S., M.B.O.U., F.Z.S., is quite an important contribution to this thorny subject and is worthy of more than a passing comment. We agree with Mr. Lancum that the Wood Pigeon and Sparrow cannot logically be defended even by the most ardent 'protectionist,' although one must not forget that the Wood Pigeon may constitute quite a valuable source of food to the small tenant-farmer. With regard to the Sparrow, the trouble is that so many people, even country people, regard all small birds as 'Sparrows,' and valuable species are often thus in danger. The useful Starling is actually becoming a pest in some localities, and at certain periods of the year. Ornithologists will probably agree that the increase in numbers of Sparrows and Starlings may be attributed to no small extent to the indiscriminate slaughter in former years of birds of prey. The Bullfinch is cited as a nuisance to the fruit-grower, but surely it is not common enough anywhere to be a serious danger.

The *Entomologists' Record* for April contains 'Wicken Revisited,' by H. Donisthorpe ; 'Lepidoptera at Jaca, Alto Aragon, Spain, in August, 1931 and 1933,' by W. Fassnidge ; 'An Account of My Studies in the Biology of *Pieris rapæ*, III,' by Orazio Querci ; 'Nomenclature : The List,' by H. J. Turner ; 'Early Stages of Indian Lepidoptera,' by D. G. Sevastopulo ; 'Notes on Collecting, etc.,' including 'Micro Larvæ Collecting for April,' 'Current Notes and Short Notices,' and Supplements, 'The British Noctuæ and their Varieties,' by H. J. Turner ; and 'Butterflies of the Upper Rhone Valley,' by R. Verity.

The *Journal of the Society for British Entomology*, Vol. I, Part 3, contains, as usual, numerous interesting short articles. There are nine Notes on Neuroptera and allied orders, including '*Psectra diptua* in Britain' ; 'A New Locality for *Boriomyia rava* Withyc., (only known from Surrey) ; and 'British Ephemeroptera, Plecoptera, and Trichoptera in 1934,' by D. E. Kimmins ; 'Ephemeroptera in the Lake District,' by W. D. Hincks ; and 'Preliminary Note on a probable addition to the British List of Ephemeroptera,' with plate by W. D. Hincks and J. R. Dibb. Other articles are 'Mortality in the Dungfly, *Scatophaga stercoraria* Linn.,' by B. M. Hobby and C. Elton ; 'Butterflies of the Somerset-Dorset Border Country in 1934,' by E. L. Crossley ; 'Some Breeding Records of Diptera and Hymenoptera,' by O. W. Richards (two important papers), and '*Sziladynus montanus* Meig. (Dipt. Tabanidæ) in Cheshire,' by H. L. F. Audcent.

Science Progress for April, 1935 (Vol. XXIX, No. 116), contains a good deal of interest to the naturalist. There is an article on 'Problems of Sex in the Higher Fungi,' by Professor Helen Gwynne-Vaughan ; 'The Interpretation of Animal Behaviour,' by S. Luckermann, of the University of Oxford ; and an extremely well-written and thought-provoking essay on 'The Limits of Science,' by G. Burniston Brown. The essay is a review of three recent and notable books : 'Scientific Theory and Religion,' by E. W. Barnes ; 'God and the Astronomers,' by W. R. Inge ; and 'Limitations of Science,' by J. W. N. Sullivan.

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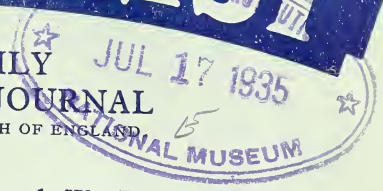
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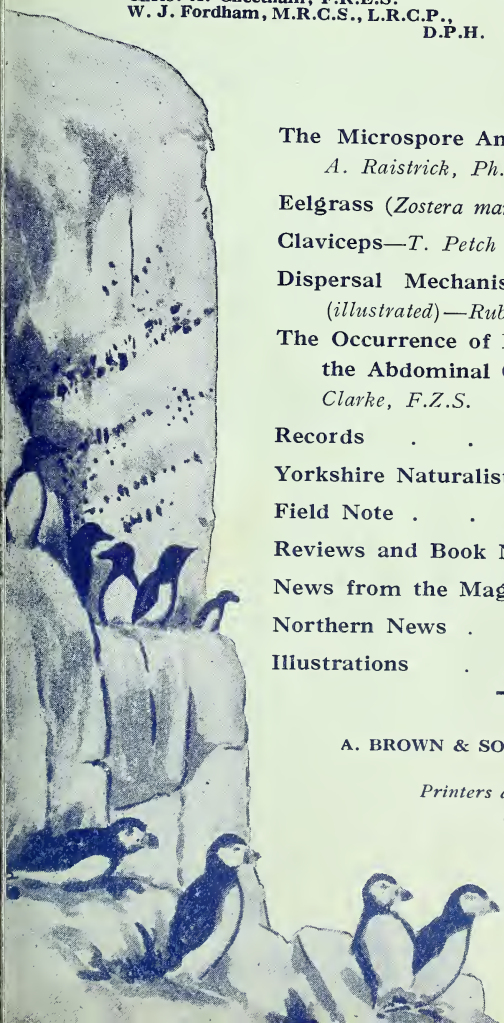
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THE MICROSPORE ANALYSIS OF COAL

A. RAISTRICK, Ph.D., M.Sc., F.G.S.

IN *The Naturalist* for June, 1932, an account was given of

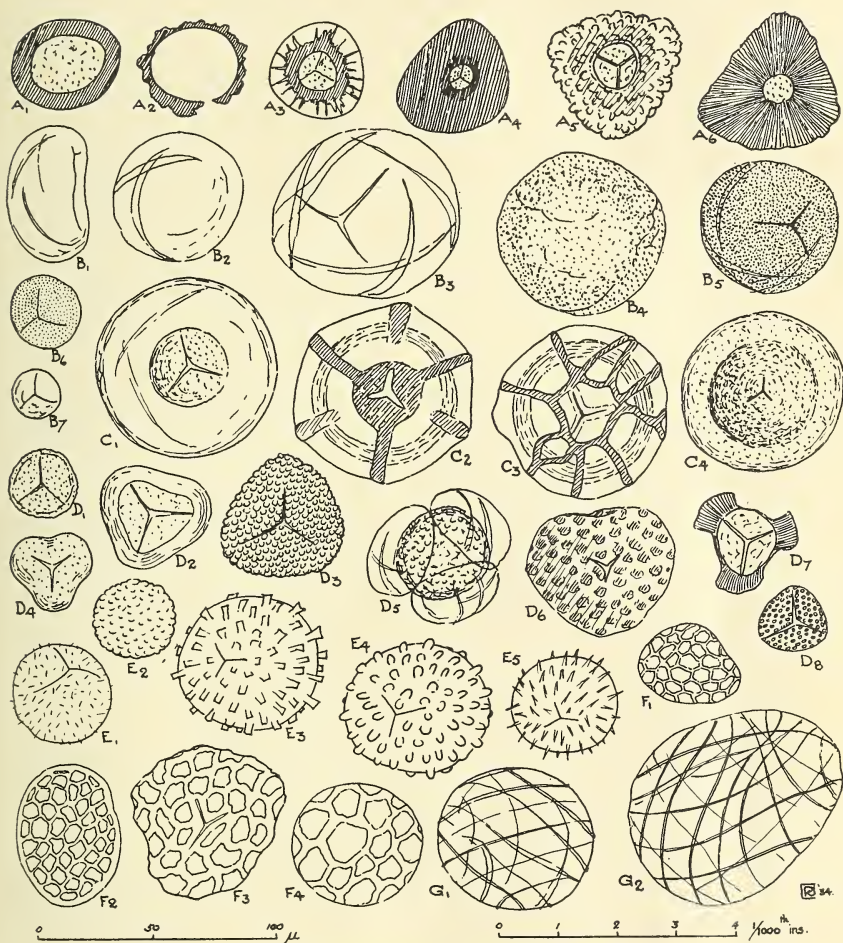


FIG. 1—Microspores from Carboniferous Coals

the methods of pollen analysis of peat, and it is the object of this note to explain the application of similar chemical and statistical methods to the study of coal, both for the purpose of general palæobotanical study and for the more immediately practical problem of the correlation of coal seams.

It is a commonplace that the duller (durain) bands of coal contain large quantities of two kinds of spores, megaspores, and microspores. The megaspores can occasionally be seen on a freshly broken surface, with a good hand lens, and are the outstanding feature of a microsection. Under the microscope the microspores are generally seen only as small points of light, and in thin sections can rarely be resolved. Some years ago attempts were made to separate the spores from coal by means of solvents, but although good results were obtained with megaspores, only poor separations of microspores were obtained. Experience in technique gained through the study of pollen in peat led to a successful method of spore separation, here described.

The coal to be treated is reduced to coarse powder, and a small well-averaged sample crushed (not ground) to pass through a 30 or 40 mesh sieve. If preparations of a variety of microspores are wanted, then almost any dull or well-banded coal will yield them, the coals from the middle coal measures carrying the greatest variety of spores. If the actual spore content of a particular seam or section of coal is wanted, then the seam is sampled either by taking a pillar of the whole seam or by a "channel," *i.e.* a narrow even cut taken down the whole height of a clean face of the seam. In the case of the pillar, this can be broken up into convenient subsections, and an average sample obtained by taking a deep saw cut at right angles to the bedding, the whole height of the pillar. The material obtained in either case is thoroughly mixed, and then crushed to pass the sieve used. The coarser material takes rather longer to treat, and tends to give rather dirtier preparations, but the finer ground coal, while being easier to separate, tends to give some proportion of broken spore material.

After preparation of the sample, about half a gram of the coal is used, and mixed with an equal quantity of finely crystallised potassium chlorate. This is mixed in a dry test-tube (any attempt to wet the coal dust at once leads to difficulties), and pure nitric acid is added to it in the rough proportion of 20 parts acid to 3 parts coal and 3 parts potassium chlorate. This mixture must be shaken at once, and it is often advisable to keep the mixture cool under running water, if any violent ebullition of chlorine takes place. The mixture is left for two days, at the end of which time, if the coal oxidation is complete the solution has a rich orange red, clear colour. The liquor is decanted with extreme care, and the tube filled with water and well shaken, and set to settle. At least three hours must be allowed for this, and, if possible, longer. It is most convenient in dealing with several coals, to have the samples in test-tubes, labelled with a wax-covered

reference number, and to prepare a dozen to twenty at a time. In this case, it is convenient to decant and wash, say at the beginning and end of one working day, and at the beginning

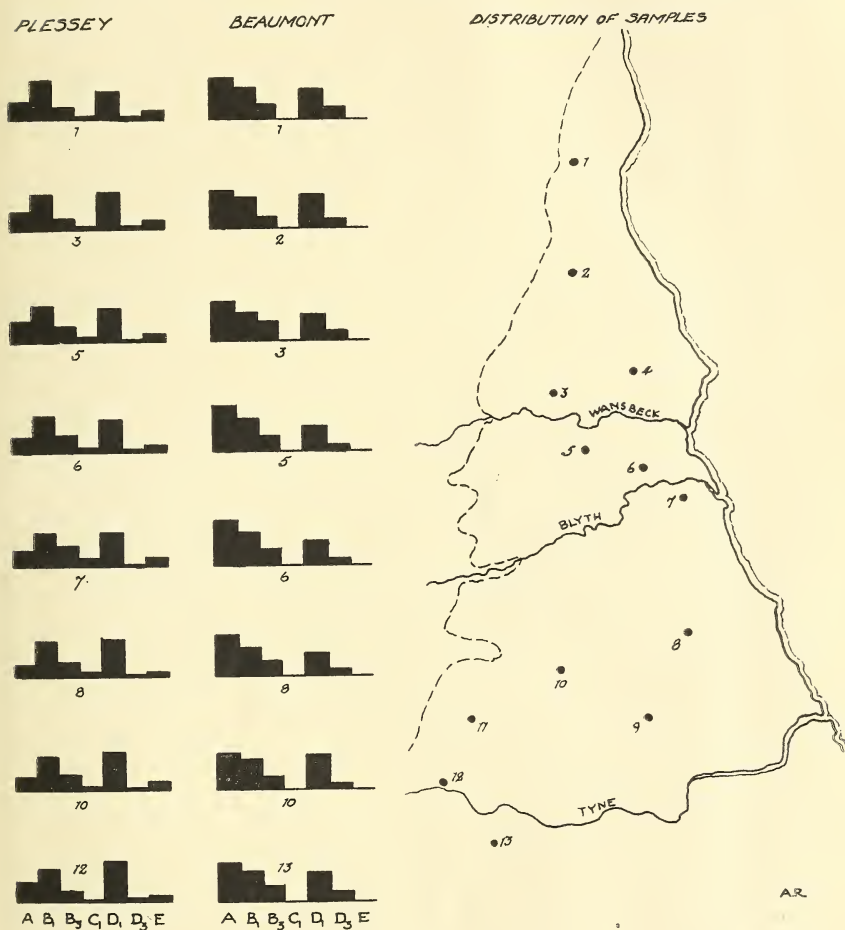


FIG. 2—Spore diagrams of two adjacent Coal Seams, over Northumberland

of the next, so getting three washings in the two days. After the third washing, the tubes are filled up with a 10 per cent. solution of potassium hydrate in water, and again allowed two days, but in this case it is well to shake the tubes once or twice a day, as the material has a tendency to cake in the potash. Again, the washings are repeated, but this time until the wash water stands clear. This may take as many

as eight or ten washings in extreme cases, the potash coming off as a thick black liquor for several times of washing. Again the utmost care must be taken to allow complete settlement between washings and in decanting.

When finally washed, the water is reduced to about two inches depth in the tube, the whole shaken together, and allowed to stand for about five minutes, to clear of the larger coaly particles. The water now carries a suspension of spore material, and of microspores, and a small quantity taken off with a pipette, preferably from the bottom of the suspension, but clear of the sediment, and placed under the microscope, will be seen to be full of microspores. It is worth while taking some care to get a good clean sample of the spores, by trying out several "dips" and keeping for mounting the three or four best. A $\frac{1}{4}$ in. lens with a wide field and good eyepiece will be quite suitable for this preliminary examination of the spore material.

The separated material finally chosen for mounting is, of course, carried in a fair bulk of water. This is gently evaporated from the slide, on a hot plate, taking great care not to allow any part to dry completely. When the water is reduced to a small amount, a small pellet of glycerine jelly (glycerine, gelatine, and carbolic acid) is added, and as soon as it melts and mixes with the water, the whole is stirred together with a fine needle. A warm cover glass is put on, and the slide set to cool. The quantity of water and jelly must be just right to give a reasonable slide, without any pressure being put on the cover glass, as this causes the spores to squeeze out at the sides, and leaves a very 'thin' preparation. When properly prepared this jelly will stiffen almost at once, and will keep in good condition on the slide for over a year. If a permanent preparation is desired, the slide can be ringed with any ordinary ringing compound.

When the preparation is examined in the microscope, a good $\frac{1}{4}$ in. lens is useful for rapid searching the slide, but for detailed work or counting, an $\frac{1}{8}$ in. lens is necessary. The microspores are seen to be mostly of bright colours, ranging from clear lemon yellow, to bright orange and chocolate brown, with occasional greenish yellow shades. The microspores separate almost at once into two groups, first the common ones, present in almost all coals and making up about 90 per cent. or more of all present, of only a few distinct types, and secondly the 'accessory' spores, with great variety of type, but numerically few in any coal. These tend to increase in quantity as one examines coals higher in the carboniferous series. For all present work, it has been found convenient to group the spores in simple associations corresponding rather

to genera, and to give these primary groups letters, A to G ; the individual types within these groups correspond to species and are indicated by a suffix number, as *e.g.* A₂, D₈, etc. In this system, 38 types of microspore have so far been figured and described (4, 5, 6), and about 6 further types, all within the groups A to G still await description. Fig. 1 illustrates 36 of these types. Some of these types have recently been described from Germany by Potonié and others (1, 3) under a new set of generic and specific names, but as so far the relationship of the microspores to the plants and trees producing them is unknown, except in a very few cases, it seems better to wait for this to be investigated, before inventing a whole new nomenclature.

For the purpose of correlation or comparison of coal seams, preparations are made as above indicated, with all quantities and treatments standardised. The microspores are determined and counted, using a mechanical stage to the microscope, the number of full traverses of the stage (or length of total traverse) being noted. The total number of spores seen, divided by the total traverse will give a factor that can be used to express comparative abundance or spore frequency, provided the slides are from strictly similar methods of preparation. The whole of the spores identified are divided into two groups, in the first, the types A, B₁, B₃, C₁, D₁, D₃, and E, and in the second, the rest. The first group is totalled, and each member expressed as a percentage. The diagram obtained by plotting these percentages as vertical blocks, in that order, is spoken of as the general seam diagram, while the rest of the spores can be expressed as percentages of this first total, and if very small in number, can be made into a similar diagram to a larger vertical scale, giving the accessory spore diagram. It is now a matter of experience that in the Durham, Northumberland, Yorkshire, Lancashire and Staffordshire coal fields, and among the coals of the lower Carboniferous and Millstone Grit, it has been possible to identify certain seams by these diagrams, which remain constant over the area of a single coalfield at least, and also to differentiate between seams close together (see Fig. 2). There are many complicating factors arising in the wider application of this method of seam correlation, but many encouraging results have so far been obtained. On the purely palæobotanical side, a wide field opens out, as both coals and coaly streaks from the base of the Carboniferous Limestone, up to the Jurassic, and the lignites of both Jurassic and Tertiary have proved to yield good separations of spore material. Purely as microscope preparations, the spores have their interest in their extremely fresh colour, and beautiful and varied ornament. The microspores average

about 60μ in size, but vary among the types from 15μ to 100μ .

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EELGRASS (*ZOSTERA MARINA*)

OF recent years considerable attention has been devoted to the fluctuations in quantity of the eelgrass in coastal waters. About 1931 there was so serious a decline in the abundance of this plant that fears were entertained that it might, in places, be exterminated. The plant is both a direct food for many waterfowl and also harbours abundant shellfish, while it serves to prevent the shifting of coastal sediments. Hence it is of vital importance to many forms of littoral life, and a number of publications have dealt with the causes of its decline in different countries. One of the latest is by C. Cottam ('Wild Life and Management' Leaflet, BS-3, U.S. Dept. of Agric., 1935) and this summarises a wide series of observations. R. W. Butcher (*Journ. du Conseil*, 9 (1), 1934, 'Conseil Perm. Internat. pour l'Exploration de la Mer') gives data for England.

It appears that a number of periods of decline have been observed in the past, followed by periods of recovery. To some extent these fluctuations are followed by variations in the numbers of visiting wild fowl. No agreement has yet been reached as to the causes of the decline. Claims that it is due to fungal or bacterial attacks have been made, while other observers suggest the alteration in various habitat factors as causes. It is not impossible that different causes may operate in different localities and that a general correlation with the well-known climatic cycles may underlie them all.—W.H.P.

CLAVICEPS¹

T. PETCH

MOST field naturalists know the ergots which are found on the inflorescences of grasses in late summer and autumn—black bodies which look like large grains. These are sclerotia, compact masses of mycelium without any spores of any kind. They fall to the ground, or into water, and at the appropriate season they produce structures somewhat like small pins, with a short cylindrical stalk and a globose head. That fructification is a *Claviceps*. It may be found in the field, but the easiest method of obtaining it is to hatch it from the ergot or sclerotium.

The head contains a peripheral layer of cavities, the perithecia. The latter contain asci, each holding eight long linear spores. The spores are arranged in a parallel bundle, and are about 100μ long, but only 1μ in diameter. The stalk is inserted into the head, so that the latter forms a collar round it. That structure is characteristic of *Claviceps*, though it is not confined to that genus.

When the fungus is mature, the spores are shot out from the perithecia and float about in the air. Plowright has recorded how, when he grew the *Claviceps* from the ergot of the common reed, he saw the spores dancing in the air in a beam of sunlight. If a spore falls on a grass flower, it infects it. But the fungus does not immediately proceed to form an ergot. It covers the ovary with a white convoluted stroma (mass of mycelium), on the exterior of which are innumerable short conidiophores which bear myriads of minute conidia. That is known as the *Sphacelia* stage, and the fungus in that condition is known as *Sphacelia segetum*. At the same time the fungus excretes a liquid which attracts flies. I once saw in Ceylon a lawn on which one of the grasses was attacked by a *Sphacelia*, and over each infected patch there was a small cloud of flies. If the flies visit other grass flowers they cannot fail to convey some conidia to them.

Thus the first infection of the grass flowers in the summer is by means of ascospores from the *Claviceps*, but subsequently infection is spread by means of the conidia.

Obviously, it is useless for the *Claviceps* to produce its ascospores until the grass flowers are open, and in accordance with that we find that the ergot does not produce the *Claviceps* until the summer. Under artificial conditions that is modified to some extent. Plowright gathered the ergots of the common

¹ The substance of a talk given to the Mycological Committee of the Yorkshire Naturalists' Union at the meeting at Ingleton, Sept., 1934.

reed (*Phragmites*), planted them in May of the following year, and obtained the *Claviceps* in June. Last year (1933) I collected the ergots of *Molinia caerulea* in October, and placed them on soil in a plant pot out of doors. In May this year (1934) I transferred them to wet blotting paper in a saucer indoors, and they produced the *Claviceps* in June. *Phragmites* and *Molinia* are not in flower in June.

The simplest way of obtaining the *Claviceps* is to keep the ergots dry until May, and then place them in a saucer on blotting paper or under moss, so that they may be permanently damp. If under moss they develop longer stalks. Some of them will retain their vitality for two years.

The formation of the ergot follows the *Sphacelia* stage. Before Tulasne carried out his investigations on the subject, there was much discussion whether an ergot was a diseased seed or not. Tulasne established that no part of the seed or ovary was contained in the ergot. It is purely a mass of fungus tissue. Its formation does not begin in the ovary, but below the ovary, on the receptacle or torus, and as the ergot develops it pushes out the remains of the ovary and the *Sphacelia*, which may sometimes be found, shrivelled up, on the apex of the ergot.

We owe our knowledge of the structure and development of *Claviceps* chiefly to the work of Tulasne about the middle of the last century. At the beginning of the current century an extensive series of experiments on the biological side was carried out by Stäger, and our modern ideas on the host plants of various species of *Claviceps* are based on his work.

In the British Isles (including Ireland for the sake of one bull) we have five recorded species of *Claviceps*, viz., *C. purpurea*, *C. microcephala*, *C. nigricans*, *C. Wilsoni* and *C. Junci*.

Claviceps purpurea was the earliest known species, as it is the one which attacks rye and wheat. It is found also on barley and many grasses. But, just as in the rusts, there are biologic forms of the fungus; for example, the fungus from *Lolium perenne* will not infect rye. There is a form which infects rye, barley, *Triticum*, *Dactylis glomerata*, *Anthoxanthum odoratum*, *Festuca arundinacea*, *Melica nutans*, *Arrhenatherum elatius*, *Poa alpina*, *P. pratensis*, *Holcus mollis*; another form which infects *Lolium* and *Bromus erectus*; and a third form on *Brachypodium* and *Milium effusum*. The fungus from a grass in one group will not infect the grasses of the other two groups.

Our second common species is *Claviceps microcephala*. The standard host plant of this species is the common reed, *Phragmites*, but it also attacks *Molinia caerulea*, *Nardus*

stricta and *Aira caespitosa*, while there is a biologic form on *Poa annua*. It does not attack the hosts of *Claviceps purpurea*.

Here we enter the disputed zone of the *Claviceps* problem. Is *Claviceps microcephala* distinct from *Claviceps purpurea*? The fact that it will not attack rye does not settle the question, as that might only mean that it was a biologic form. To establish it as a distinct species there must be some morphological differences.

Tulasne, who instituted *Claviceps microcephala*, stated that it was easily distinguished from *Claviceps purpurea*, because the tissue of the head was loose, and, consequently, when it dried, the head shrank, so that the perithecia became prominent and the head resembled to some extent a dried fruit of *Rubus*. When placed in water or alcohol, the fungus soon imparted its colour to the liquid.

Tulasne's statement scarcely seems sufficient to warrant the institution of a separate species. There are some species of *Cordyceps* (which is the next genus to *Claviceps*) with a globose head which sometimes remains globose when dried, but sometimes shrinks on drying, so that the perithecia become prominent. Moreover, the perithecia do not always become prominent in *Claviceps microcephala*.

About sixty years ago this question was taken up by a Scottish mycologist, A. S. Wilson, who carried out numerous experiments, growing *Claviceps* from ergots. He was strongly of opinion that there was only one species of *Claviceps* on grasses in Britain. He sent specimens to Berkeley, who identified them as *C. purpurea*, when they should, according to the host, have been *C. microcephala*, and as *C. microcephala* when they should have been *C. purpurea*.

Berkeley, in his *Introduction to Cryptogamic Botany*, recorded that Mr. Currey had sent him specimens of *Claviceps purpurea* on the ergot of the common reed, which usually produced *C. microcephala*. According to our present ideas, that could not have been *C. purpurea*, and it may perhaps be deduced that the criteria on which Berkeley relied for the separation of the two species were invalid.

Plowright, who grew the *Claviceps* from the ergot of the common reed, assigned his specimens to *C. purpurea*, but, probably in deference to current opinion, he distributed them as *C. purpurea* var. *microcephala*.

Stäger gives the following distinguishing characters of *Claviceps microcephala*.

(1) Its smaller size.

(2) Generally only one, or at most two or three, *Claviceps* arise from an ergot.

- (3) Its long thin stalk and strictly globose head.
- (4) The stalk arises from the ergot without any mycelium at its base, whereas in *C. purpurea* the base of the stalk is surrounded by mycelium.
- (5) The conidia are larger.
- (6) Its hyacinth-red colouring matter.

Against these, we may place the following data.

- (1) The *Claviceps* develops entirely at the expense of the food stored in the ergot. Consequently a *Claviceps* which grows from a small ergot, such as those of *Molinia*, would be expected to be smaller than those which grow from the large sclerotia of rye. As ergots vary in size on the same host, this could be tested by growing the *Claviceps* from ergots of different sizes from the same host.
- (2) I have up to thirteen *Claviceps* on one ergot from *Molinia caerulea*.
- (3) In my specimens from *Molinia*, some of the heads are almost sessile. The length of the stalk probably depends on external conditions (Wilson noted that they were longer when grown in moss), and on the number which arise from one ergot.
- (4) This was controverted by Wilson.
- (5) Stäger gives the dimensions of the conidia of *C. purpurea* as $7 \times 3.5\mu$, and those of *C. microcephala* as $7-8 \times 3.5\mu$.
- (6) I failed to obtain any colouring matter from *C. microcephala* from *Molinia* on placing the ergot and its *Claviceps* in alcohol (rectified spirit).

None of Stäger's differences appear to be valid from a morphological standpoint, even if correct.

This a question which still requires investigation. The chief difficulty is the supply of material. The *Claviceps* must be grown in quantity from ergots from different hosts, and carefully compared, to ascertain what morphological differences, if any, exist.

Our third species is *Claviceps nigricans*. This occurs on *Eleocharis palustris*, and has been found in Dorset and Fife. Cooke stated that the ergot was common enough in Britain on *Eleocharis*, but the mature *Claviceps* had not been found. That is merely a matter of growing the *Claviceps* from the ergot.

The Irish bull is *Claviceps junci*, described by Adams from a specimen on *Juncus glaucus*. He certainly did not have a *Claviceps*. He may have had a *Sphacelia*, but as he described

the fungus as filling the ovary with spores, even that is doubtful, because the spores of a *Sphacelia* occur on the exterior of the ovary. However, that may have been merely a loose description. But no *Claviceps* or ergot has yet been recorded on *Juncus*.

Finally, we have *Claviceps Wilsoni*, which is a mystery still awaiting solution. The fungus occurred on *Glyceria fluitans*, and was discovered by A. S. Wilson. Ergot, it may be noted, is quite common on that grass. Wilson apparently had a pet ditch for the ergot on *Glyceria fluitans*, and one year he found that on one side of the ditch something had gone wrong with the *Claviceps*. Instead of growing up in the usual shape, they formed rather loose columns which bore superficial perithecia. That did not happen in every case. Many of the ergots produced normal *Claviceps*, and some produced both normal and abnormal ones. Wilson sent specimens to Plowright, and between them they decided that the superficial perithecia were those of a fungus parasitic on the *Claviceps*, which they called *Barya aurantiaca*. But Wilson also sent specimens to Cooke, and Cooke described it as *Claviceps Wilsoni*. Saccardo took up Cooke's name, but if it is really a *Claviceps* it must stand as *C. aurantiaca*. That, however, is a minor point. The chief question is, what is *Claviceps Wilsoni*? It is certainly unlike any other *Claviceps* in structure, and it would seem that Plowright and Wilson's theory may be correct. Stäger accepted *Claviceps Wilsoni* and gave a description of it, but his description shows that he did not have Wilson's fungus. However, he established that the *Claviceps* on *Glyceria fluitans* on the Continent does not attack any other grass.

Stäger has described a new species, *Claviceps Sesleriae*, on *Sesleria caerulea*, *Melica nutans*, and *Melica uniflora*. It differs from *C. purpurea* in the dimensions of its conidia, $10.5-14 \times 3.5-7\mu$ as against $7 \times 3.5\mu$. We ought to find that in this country. It is to be observed that *Melica nutans* is attacked by two species of *Claviceps*, *C. purpurea* and *C. Sesleriae*.

The 'Fungus Flora of Yorkshire' records only *Claviceps purpurea*, on *Lolium perenne*, *Anthoxanthum odoratum*, *Dactylis glomerata*, and *Glyceria fluitans*, but I am informed that other species have since been added to the county list.

In August, 1934, ergots were collected in East Yorkshire on the following grasses: *Festuca arundinacea*, Hedon, Saltend; *Dactylis glomerata*, Hedon, Aldborough, not common; *Arrhenatherum elatius*, Hedon, Aldborough, common; *Triticum repens*, Hedon, rare; *Digraphis arundinacea*, Aldborough; *Lolium perenne*, Hedon; *Glyceria fluitans*, Aldborough.

DISPERSAL MECHANISMS OF *BIDENS* *TRIPARTITA*, L.

RUBY E. DOWLING

(Dept. of Botany, University College, London)

IN the summer of 1934, *Bidens tripartita* occurred in abundance round a considerable part of the smaller reservoir at Aldenham, Herts. The writer had occasion to walk through this vegetation and can attest to the efficiency of the barbed pericarp and appendages as a means of fruit dispersal; literally hundreds of fruits were collected from the clothing worn on this walk. It is of some interest that the presence of these adherent fruits was soon realised by the not inconsiderable



Mass of fruits of *Bidens tripartita*, a number of which have germinated
(About $\frac{2}{3}$ natural size)

discomfort which they caused, and this suggests that in the fur of animals they might also cause irritation, resulting in attempts to get rid of them as soon as possible. Consequently rendering effective the dispersal mechanism of which the fruit appears to be so well adapted.

On a subsequent visit to the reservoir (December, 1934), there was found, floating in the water, a compact mass of *Bidens* fruits, measuring about $3\frac{1}{2}$ by $1\frac{1}{2}$ by $\frac{3}{4}$ inches. This at once suggested the possibility of a subsidiary fruit dispersal mechanism in this plant. These fruits were collected and kept in an open glass dish in water in a cool greenhouse. In February, 1935, the temperature of the greenhouse was raised, and it was then noticed that the *Bidens* fruits had begun to germinate, an observation which suggests that prolonged immersion of these fruits does not impair their viability.

Dispersal by water is known to occur in this plant. Guppy¹ draws attention to the capacity to float shown by the fruits of this species, while Ridley² records that 'in such fruits

[i.e. those in which the ovary is securely enclosed in the tubular part of the calyx] the outer tube consists of an aeriferous tissue forming a layer over the whole fruit.' It would be interesting, however, to know if this dispersal mechanism is often resorted to by *Bidens tripartita*.

In view of the known occurrence of one or two species showing more than one seed dispersal mechanism,³ it seems desirable that detailed records should be made of species showing this capacity on account of its possible biological and ecological significance.

LITERATURE CITED

¹ Guppy, E. B., *Observations of a Naturalist in the Pacific*, London, 1906.

² Ridley, E. N., *The Dispersal of Plants Throughout the World*, Ashford, 1930.

³ Dowling, Ruby E., The reproduction of *Plantago Coronopus*: an example of morphological and biological seed dimorphism, *Ann. Bot.*, XLVII, 1933.

THE OCCURRENCE OF FISH OF THE GENUS *BLENNIUS* IN THE ABDOMINAL CAVITIES OF CODFISHES

W. J. CLARKE, F.Z.S.

ON February 23rd, 1935, my friend, Mr. F. Grant, was cleaning a small codfish, weighing about 5 lbs., when he found loose in the abdominal cavity, lying near the intestines, two small, hard shrivelled-up eel-like fishes. These were not contained in the gullet, stomach, or intestines of the codfish, but were loose in the cavity, and there was no mark or scar to show that an entry had been made from outside.

I know of only one species of fish—the Hagfish (*Myxine glutinosa*)—which would be likely to enter the interior of other fishes. This species regularly attacks fishes of the cod family, attaching itself by its suctorial mouth, rasping a way through skin and flesh by means of its chisel-like teeth, and entering the body of the living fish, where it lives upon the non-vital portions of its host until the victim dies of exhaustion. The Hagfish is well known to the Yorkshire fishermen under the name of 'Borer,' and the very emaciated codfish suffering from the attacks of these parasites are known as 'Slinks.' But these little fishes were not Hagfish.

Mr. Grant took care of his two dried-up little fishes, each about $2\frac{1}{2}$ in. in length, and gave them to me. They reminded me that about two years ago Mr. Dinnewell had shown me a hard shrivelled-up fish which he told me had been found in exactly similar circumstances free in the abdominal cavity of a codfish, which, like Mr. Grant's, had been caught off Scarborough. This fish, so far as I could see, was a Viviparous

Blenny about 4 in. in length, and at the time I concluded that most probably an error in observation had been made, and that the fish had fallen to the position where it was found, from some part of the digestive tract during the process of gutting. I looked up Mr. Dinnewell and was pleased to find that he had preserved his specimen, and, together with the two smaller examples, I sent them to Mr. J. R. Norman at the British Museum (Natural History) with a request for information about them.

Mr. Norman very kindly replied as follows :—‘ I received your letter of March 7th, together with the small dried-up fishes for identification. The two small ones are specimens of the Butterfish, or Gunnel (*Centronotus gunnellus*), and the larger one is, I think, a Viviparous Blenny (*Zoarces viviparus*), but it is too far gone to identify with certainty.’

‘ Your account of how these fishes were found is very interesting. In 1932 Mr. Deraniyagala described similar dried-up eels in the bodies of several large Perch-like fishes in the seas of Ceylon, and suggested that these had entered by way of the cloaca (P. E. P. Deraniyagala : “ A curious association between *Ophichthus apicalis* and Percoid fishes : ” *Ceylon Journal of Science*, Section B, Vol. 16, 1932, p. 355).

‘ More recently, however, two American authors have described mummified eels in the body cavities of big Groupers and they feel fairly certain that the fish must have penetrated the walls of the stomach to get into this situation. (C. M. Breder and R. F. Nigrelli : “ The penetration of a Grouper’s digestive tract by a sharp-toothed eel.” *Copeia*, 1934, No. 4, p. 162.)

‘ In the case of the Cod I am pretty sure that the Butterfishes and the Blenny were swallowed in the ordinary way and, the stomach being distended with a very large meal, some of the contents forced their way through its walls. Normally, one assumes that the Cod would have died of peritonitis, but if this did not occur the little fish would dry up.’

I should like to take this opportunity of expressing to Mr. Norman my very grateful thanks for his help in this, and other instances where I have asked his assistance, which has always been promptly and cheerfully given.

RECORDS

Polydrosus pilosus Gredl. (*Insecta*, *Col.*) in Yorkshire.—In the *Entomologists’ Monthly Magazine* for February, 1935, p. 37, Mr. Donisthorpe has introduced *P. pilosus* Gredl. as a British insect, and has pointed out the characters which distinguish it from *P. cervinus*. Examination of my series of sixteen specimens standing under the latter name showed that thirteen

were really *P. pilosus*. The species is evidently widely distributed in Yorkshire, for the specimens came from Cotherston (Teesdale), 26th June, 1913; Hayburn Wyke, 31st May, 1919; Staintondale, 22nd June, 1927; Buttercrambe Woods, 18th June, 1927; and I have recently taken it in fair numbers on Silpho Moor, 29th April, 1935; and singly at Helmsley, 4th May, 1935. Mr. Donisthorpe records it from larch; I have no note of the trees on which it occurred in the early records, but on Silpho Moor it occurred chiefly on sallow, with odd specimens on hawthorn and larch, and at Helmsley I took a single specimen on Sitka spruce. All our Yorkshire records of *P. cervinus* are now suspect, and the species must be recorded anew; the authentic specimens in my collection are from the New Forest. Mr. Donisthorpe has kindly confirmed my identification of the species.—GEO. B. WALSH, SCARBOROUGH.

NEW YORKSHIRE DIPTERA

Oxya plantaginis Hal., Welwick, on *Limonium*, 30/7/1933, T. Stainforth. This species deforms the inflorescence of *Aster tripolium*. Dale says that it is common on *Statice limonium*. It has been taken at Greatham, Co. Durham, by J. W. H. Harrison on flower heads of Sea Aster.

Sphenella marginata Fln., Welwick, on *Limonium*, 30/7/1933, T. Stainforth. This species is not abundant, but is found by sweeping thistles and ragwort in July and August. It is recorded by Wingate from Hesleden, Co. Durham, and has been taken by Harrison at Birtley among ragwort seeds. It occurs as far north as the Forth district. The larva causes swellings on the flower heads of *Senecio vulgaris*, *S. jacobæa* and *S. aquaticus*. It is parasitised by the braconid *Microbracon variator* Nees.

Dolichopus acuticornis Wied., Barmby Moor, 4/8/1924, W.J.F. An uncommon species taken in Wales, Ireland and in Suffolk. The writer has taken it freely on the sandhills at South Shore, Blackpool.

New to East Yorkshire are *Dolichopus claviger* Stan. from Frog Hall, Allerthorpe, 11/7/1928, by no means a common species except locally, recorded from Bolton Woods and taken at Sunderland and in Nottinghamshire, and *Tachydromia pallidiventris* Mg. from Allerthorpe, 24/6/1923, previously taken in Yorkshire in Coverdale and recorded from Lancashire and Cheshire and Cumberland. It has been found preying on *Conicera atra*, on honeydew of *Aphis cratægi* in Suffolk, and has several times been taken as the prey of crabronids.

I am indebted to Mr. J. E. Collin for kind help in the determination of the above-mentioned flies.—W. J. FORDHAM, M.R.C.S., L.R.C.P., D.P.H.

YORKSHIRE NATURALISTS AT HORNSEA

EASTER usually falls so early in the year that it is little use arranging an excursion at this holiday, but this year the date April 20th—22nd gave promise, and by fixing a locality with exceptional geological and ornithological interests we had a successful meeting, some fourteen societies being represented at the roll call.

To those present who were familiar with the boulder clay masses of West Yorkshire the material which constituted the cliffs presented some interesting questions, for on examination the percentage of included boulders showing traces of smoothing or rounding was very low, and of those showing striations the majority were carboniferous limestone and probably came from the West Riding or Westmorland. The great mass of included material showed little evidence of travel under a moving ice sheet on land, whilst the frequent layers of sand or shingle clearly broke the mass up into a series of episodes.

Geology : Our President, Mr. W. S. BISAT, writes that the geologists spent the week-end entirely on the coast sections, and thanks to the assistance with transport given by members of other sections of the Union, were enabled to examine sections of the glacial beds at points as far apart as Ulrome and Dimlington. Exposures generally were very good, a feature being the great extent of the Basement Clay exposed at half-tide on the foreshore at Dimlington. The exposures at Holmpton were much clearer than last summer, and the sections immediately north of Hornsea, which have been poor for some time, shewed some improvement near the promenade. The sections south of Aldborough were also excellent.

At Skipsea the cliff sections in peat and underlying lake muds were well seen, an interesting exposure also being visible on the foreshore below half-tide. Here were noticed lake muds with *Unio* about fifty yards south of the centre of the present peat exposure in the cliffs. This gives an indication of the depth of the Skipsea lake or channel. Of more general interest at Skipsea was the discovery that the boulder clay seen immediately beneath the lake muds in the cliff and well exposed for about two hundred yards to the south is the Upper A₂ clay (the grey clay of Aldborough)¹ containing great quantities of chalk erratics, and itself lying in a basin or depression in the Lower A₂ boulder clays, which contain much less chalk. This new record shews that the Skipsea depression dates back to locally early glacial times. It is not the only example in Holderness of a later boulder clay being deposited in an embayment or channel cut out of an earlier bed of clay, for at least two other examples were seen on this excursion, at Hornsea and Dimlington. At Hornsea there is a bluff of reddish clay of B₁ age at the south end of the promenade, where it forms a low terrace, banked against the chalky grey Upper A₂ clay. At Dimlington, at the north or Out Newton end, the gravel-filled gully has a floor of reddish clay of B₁ age, which rises to about four feet above high water, and which is resting in a ravine cut out of the earlier drab clays (Lower A₂). At this locality it is not impossible that the drab clays are themselves resting in a hollow formed in the A or Basement Clay, and clearer sections may decide this point. This partial plugging of early glacial depressions by the deposits of later glacial episodes, which depressions have nevertheless persisted down to the present day in a semi-choked condition, is an interesting feature brought out by recent study of the beds.

¹ W. S. Bisat, '*The Naturalist*' 1932, p. 216.

Several exposures of the green and red colour bands were seen, the green below and the red above. In the green bands chalk is absent, and it appears that flints also are absent. On the other hand, carboniferous limestone is present and sometimes shews scratches. Mr. F. A. Mason kindly demonstrated for us that the green bands have a much less alkaline reaction than the red bands, but the facts above adduced suggest that this reduction in alkalinity is due more to initial absence of chalk in the green band than to subsequent leaching. It appears that several times at the end of periods of deposition of normal boulder clay there occurred a very brief interlude during which supplies from all chalk areas were completely cut off, material arriving only from the north, and this for some unexplained reason was stained with ferrous oxide. Subsequent slight slumping and redistribution of the higher parts of the irregular top of the boulder clay sheet led to mixing with and oxidation of the upper part of the green band, resulting in the production of the familiar red band and boulder clay "head."

The brown chalkless bed at the base of the cliff at Skirlington Hill was seen to extend at least as low as the half-tide level. This bed contains a moderate amount of Magnesian Limestone. The extension of the Upper A₂ bed to Skipsea as recorded above increases its known range along the coast to at least fifteen miles.

The bluff of reddish clay at the south end of the Hornsea promenade mentioned above, contains an unusual amount of igneous rocks for a bed of B₁ age, including quartz porphyry, Cheviot porphyrite, grey granite, and a pale variant of Shap granite, but no black flints.

Typical Shap granite, as is usually the case in Holderness, was very rare, and only two or three pieces were seen on the beach. I have only once seen a piece *in situ* in the Holderness cliffs, and that was two hundred yards north of the Skipsea slipway, at beach level, in a bed evidently well down in Lower A₂.

Vertebrate Section: Mr. C. F. PROCTER writes: Saturday was devoted to the West end, and part of the North side of the Mere. Two red squirrels were seen. The grey squirrel has never been recorded for Hornsea. A very good show of ducks was present. Many mallard, pochard, tufted, and goldeneye were seen, together with six pairs of widgeon and nine pairs of teal. Three ducks of a species that were not identified were noted. It is believed they were gadwall, but no one was quite sure. A mallard's nest with six eggs was near the heronry, but the watcher assured us that there were many nests already laid up. Coots were plentiful, but there were only a few water-hens. There were many cormorants preening and sunning themselves.

A heronry was visited, the keeper reporting twenty-nine nests. We counted twenty-five from one stand. There were two mute swans nesting, and thirty-seven great-crested grebe were counted. The little grebe was also seen, but although it occurs in considerable numbers, it is not always evident. There were a good many other swans round about the Mere. Stock-doves, ring-doves, lapwings, carrion-crows, rooks, jackdaws, black-headed gulls, were seen in numbers. A cuckoo was heard from several directions. Swallows arrived on the 10th, and were seen in small numbers. Seven kingfishers were observed. A pure albino cock pheasant was very noticeable paying his attentions to one of the ladies of his harem in a favourite haunt of his that he has occupied for four years.

The tree-creeper, reed-bunting, chaffinch, bullfinch, tree sparrow, pied and yellow wagtail, long-tailed tit were observed in addition to all the common finches. Partridges and pheasants were numerous. The green woodpecker was heard.

On Sunday, Spurn peninsular, Kilnsea, The Beacon, and Cherry Cob Sands were visited. The wheatear was abundant at Kilnsea, together with the reed bunting, grey linnet, skylark, and redshank. Three hooded crows were seen and a few dunlin, ringed plover, and a landrail, but no lesser terns. At Cherry Cob Sands considerable numbers of shell-duck and curlew were seen, together with magpie and carrion crow, nineteen shell duck and about fifty curlew being counted in one field alone. Mr. Procter stated that there are about fifty pairs on the short stretch of the foreshore.

The keeper's gibbet at the Wassand end of the Mere exhibited little owls, magpies, kestrels, hooded crows, sparrow hawks, weasels and stoats, hedgehogs and rabbits. The willow wren was plentiful and the sedge warbler was seen. Very large numbers of small roach were seen in the boathouse at the West end. Nothing was seen of the bearded tit ; it has not been observed for some years.

Entomology : Mr. T. STAINFORTH (Hull) writes : The entomologists took advantage of the rarely afforded opportunity of visiting the Wassand end of the Mere. Here, reed beds and heaps of cut reeds offered promising collecting ground for the species of Coleoptera and other classes of insects characteristic of such habitats. Promising as the area seemed, the result of much hard work was somewhat disappointing, and it did not yield the rarer species which many years ago were recorded for this part of the Mere, probably owing to the early date of the excursion.

It may, nevertheless, be of interest to indicate the association of beetles to be found by the Mere side, in the swampy ground at the roots of the reeds, in the early spring. Most common of all everywhere was *Elaphrus cupreus*, but although I saw some hundreds of this species, not a single *E. riparius* was to be found. The 'Anchomenid' group was represented by *Europhilus (Anchomenus) thoreyi* v. *puellus*, *E. gracilis*, and *Anchomenus ruficornis (albipes)*. These were about equally common. The genus *Pterostichus* was supported by *minor*, *diligens*, and *nigrita* ; and *Bembidion* by *assimile* and *aeneum*. In such a locality *Loricera pilicornis* was, of course, inevitable. Of the Staphylinids the most abundant were *Lathrobium brunnipes* and *Quedius fuliginosus*. Although I sought for the genus *Stenus*, having a sneaking predilection for this group, I found them either very scarce or very shy in putting in an appearance, the only species obtained being *bimaculatus*, *juno*, and the tiny *vafellus*. Other brachelytra found were *Othius punctulatus* and *Philonthus intermedius*.

Hydrotus fuscipes naturally abounded among submerged weeds, and the only *Gyrinus* taken was *elongatus*. At Wassand the trunks of several dead trees showed the burrows of *Sinodendron cylindricum* and as though to establish a liaison between entomology and ornithology the naturally dominating theme of this excursion to such a wonderful bird sanctuary, an old dead ash tree, attacked by this beetle, showed abundant peckings from base to summit made by woodpeckers in search of the succulent grubs.

It was observed that under loose bark of dead and recumbent poplars, somewhat numerous on the north side of the Mere, the larvæ of the common Cardinal Beetle (*Pyrochroa serraticornis*) were abundant. A dead swan had attracted only numbers of *Thanatophilus (Silpha) rugosus*.

As for Hemiptera, a species of *Salda* occurred in the reed beds, and the Water Scorpion (*Nepa cinerea*) abounded in shallow pools.

Diptera : Your Secretary saw very few flies, but on the occasional masses of dead seaweed *Fucellaria maritima* Hal. was caught. On the

way to the Mere a sheltered road had a plentiful supply of the large midge *Chironomus plumosus* L. and the smaller *C. chloris* Mg. In fields by the Mere side *Bibio Johannis* L. was fairly plentiful and on the shore of the Mere *Lispa tentaculata* De Geer., *Campsicnemus curvipes* Fal., and *Lonchoptera lutea* Panz. were taken, and in the woodland *Tipula lateralis* Mg. and *Ormosia lineata* Mg.

Flowering Plants : Mr. T. STAINFORTH (Hull) writes : No flowering plants of special note were seen at this early date. In the plantations surrounding the Mere were seen in flower Red Campion, Wood Sanicle (very few quite out), Wood Anemone, Lesser Celandine, Primrose, Dog Violet, Bluebell, and, on the hedges, Blackthorn.

Here and there in the marshes masses of Marsh Marigold afforded splashes of bright colour, and in a pond *Ranunculus pellatus* was flowering. In the fields were the Cuckoo Flower, Hairy Bitter Cress, Common Whitlow Grass, Coltsfoot, Red Deadnettle, and Ground Ivy.

Mosses : The most interesting seen by the shore were *Bryum atropurpureum* W. and M., and *Pottia Heimii* Fuernr. and in the fields near the Mere *Thuidium recognitum* Lindb. Others were *Barbula unguiculata* Hedw., *Dicranoweisia cirrata* Lindb., *Dicranum scoparium* Hedw., *Fissidens taxifolius* Hedw., *Bryum bimum* Schreb., *Mnium affine* var. *elatum* B. and S., *Aulacomnium androgynum* Schwaeg., *Climacium dendroides* W. and M., *Brachythecium rutabulum* B. and S., *Plagiothecium denticulatum* B. and S., *Eurhynchium praelongum* Hobk., *Amblystegium serpens* B. and S., *Hypnum cuspidatum* L., *Hylocomium squarrosum* B. and S.

Fungi (F. A. MASON) : The damp Alder-Willow woods on the North side and West end of the Mere yielded very few Agarics, and only a few species of common occurrence were noted. *Hypholoma fasciculare*, *H. sublateritium*, *Psathyra spadiceo-grisea*, *Psilocybe spadicea* and *Coprinus plicatilis* were found near the Mere. *Tubaria furfuracea* was not uncommon and its var. *trigonophylla* was found on a grassy ride between a Larch plantation and a Thorn fence.

The minute Basidiomycete, *Solenia anomala* var. *ochracea*, which may be easily mistaken for a Discomycete even when seen under a lens, was found on decorticated Alder branches.

The Jew's Ear, *Auricularia auricula-Judæ*, occurred on Elder at the West end of the Mere. This common fungus is rarely found on other trees, although in Yorkshire it has been recorded on Elm, Ash, Willow, and Barberry. During the Excursion on Monday, Mr. T. Stainforth called my attention to fine specimens growing in fair abundance on Poplars on the North side of the Mere. No mention is made by C. Rea, *Brit. Basidiomycetes*, of the Jew's Ear on Poplar, and its occurrence on this tree is a new record for the county.

Stereum spadiceum and *S. hirsutum* were found on Poplar and *S. purpureum* on Birch.

Exidia glandulosa was not uncommon on fallen branches of deciduous trees in the plantations adjoining the West end of the Mere. *Tremella lutescens* was found on Hawthorn twigs at Skipsea.

Uredines were not yet abundant and the species seen were as follows :—

Uromyces Fabæ De B. on *Vicia* sp., North side of Mere.

U. Ficariæ Lé v. on *R. Ficaria*, commonly distributed.

U. Junci Tul. on dead rushes, West and North sides of Mere.

U. Dactylidis Otth. on *R. repens*, West of Mere.

U. Poæ Raben. on *R. Ficaria*, Skipsea and West of Mere.

Puccinia obtegens Tul. on *Cirsium arvense*, Skipsea and West of Mere.

P. variabilis Grev. on *Taraxacum*, Skipsea.

P. Menthæ Pers. on *M. aquatica*, West of Mere.

P. tumida Grev. on *C. denudatum*, North of Mere.

P. Caricis Reb., æcidia on Nettle, West of Mere.

P. Magnusiana Körn., teleuto-spores on old leaves of *Phragmites*, Mere.

P. Phragmitis Körn., West of Mere. The æcidial stage of this

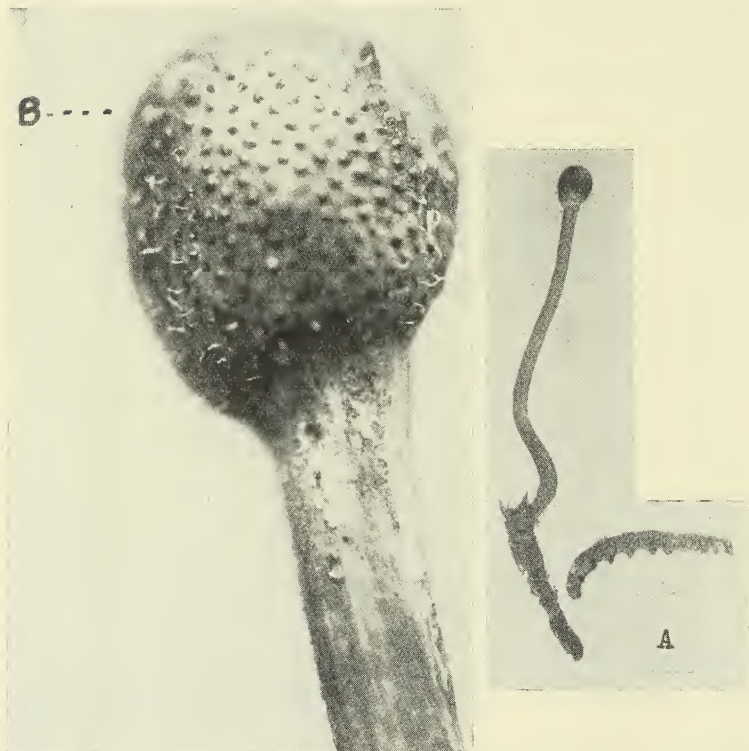


Photo by]

Cordyceps gracilis

[F.A.M.

A. Fungus and Larvæ, note size.

B. Stroma $\times \frac{1}{2}$

species, on the leaves of *Rumex hydrolapathum*, has been recorded at Hornsea Mere by the late R. H. Phillip, but no mention is made of the teleuto-spores on *Phragmites*. The sori of this species are larger and thicker than those of *P. Magnusiana*, as pointed out by W. B. Grove, and the two fungi may be readily separated in the field by this character.

Melampsoridium betulinum Kleb. on Birch seedlings, West of Mere.

A few Discomycetes were collected which included *Mitrophora hybrida* (Sow.) Boud. by the edge of planted Oak-Wood, South-west of Mere ;

Aleuria vesiculosa (Bull.) Boud. on gravelly ground, near Hotel ; *Mollisia cinerea* (Batsch) Fr. and *Dasyscypha nivea* (Hedw. fil.) Sacc., both on Hawthorn, Skipsea.

Among Pyrenomycetes, *Cordiceps gracilis*, Mont. and Dur. on a lepidopterous larva was found by Miss L. M. Anderson at Holmpton. This is the species formally recorded in the county as *C. entomorphiza* Dicks., and it has not previously been found in S.E. Div. (V.C. 61). The specimen was in a freshly mature condition and it remained moist for several days. During its examination, while still in that condition, it was observed that spore discharge was active and from the perithecia the spores oozed in long adherent thread-like masses. Extrusion could be accelerated by breathing on the specimen, after which the stroma assumed a glistening appearance. I have not seen this phenomenon at any other time and the accompanying photograph is an interesting record of it.

Dead stems of *Phragmites* collected on the margins of the Mere, and dredged up from the bottom, furnished two species not previously recorded in Yorkshire :—

Hendersonia Phragmitis Desm., Raben. Krypt. Fl., Die Pilz, VII abt., p. 219.

Stagonospora vexata Sacc., *loc. cit.*, p. 980.

Other Fungi Imperfecti collected were :—

Botrytis cinerea f. *sclerotiphila* (Raben.) Sacc., well developed conidial growths covering sclerotia on herbaceous stems, West of Mere.

Ramularia calcea (Desm.) Ces. on Primrose leaves, West of Mere.

Cladosporium herbarum (Pers.) Link., on old orange rind, Skipsea.

Phyllosticta Violæ Desm. on *V. Riviniana*, Skipsea.

Cylindrocolla Urticæ (Pers.) Bonord. on dead Nettle stems, West of Mere.

Urocystis Violæ (Sow.) Fisch. v. W., on the petioles of *V. canina*, and *Synchytrium aureum* Schroet. on Ribwort Plantain, Skipsea, provided good examples of fungous galls, to which category may be added the root-nodules of Alder, *Frankiella Alni*.

FIELD NOTE

A Cemetery of Rabbits.—During a visit to Westwoodside, near Doncaster, at Easter, I came across a sand pit in one of the fields in which were many rabbit burrows, some of which were still in use and rabbits were plentiful. Littered over the whole sandy surface of the pit were a great number of bleached rabbit bones, including many leg bones, vertebræ, and some skulls ; one of the skulls was that of an immature rabbit, the others were mature. One carcase lay rotting and seemed about a week dead. (Cf. Mr. Bayford's 'rat cemetery' record in *The Naturalist* for May, 1935, pp. 111-112.)
—ELLEN GALLWEY.

REVIEWS AND BOOK NOTICES

Half Mile Down, by Wm. Beebe, pp. 344, 8 coloured plates and 123 illustrations (John Lane, the Bodley Head 18/-). The animal life of the deeper parts of the sea is very little known in spite of the investigations carried out by oceanographical workers. The reason for this is that deep-sea trawls and nets can only be moved comparatively slowly and, hence, the more active creatures are likely to escape capture. The impression obtained by more deep sea workers has been that life is comparatively scanty in deep waters. The opposite view is now advanced by Dr. Beebe as a result of his personal observations at great depths near Bermuda. Accompanied by one colleague, he has frequently descended in a specially constructed steel ball (named the bathysphere). The maximum depth reached was 3,028 feet. At this depth the whole sphere was under a pressure of 7,000 tons, while each of the two fused quartz windows had on it an external pressure of over 19 tons. One window was fused for observation and the other was employed for photography and for projecting a powerful beam of light outside the sphere, a measure necessary because absolute darkness reigns below 2,000 feet even in the brightest tropical sunlight. The observations recorded by Dr. Beebe are of the greatest interest and could only have been possible to an acute observer with an intimate knowledge of deep sea life. A number of unknown fishes have been seen and described. What most impressed the author, however, was the abundance of the animal life as compared with the poverty of the deep-sea records. Equally impressive was the large size of many of the animals seen in contrast to those actually captured in nets. While a twelve-inch fish would be a giant in the nets, a large proportion of those seen below 2,000 feet were over twenty-four inches in length. A third striking feature was the power of illumination possessed by many if not most of the deep-sea creatures; some, like deep-sea shrimps, were able to discharge a multitude of sparks or a luminous fluid, others like the fish were supplied with special luminous areas or photophores. No decrease in the activity of the animals was noticed as the depth increased. Dr. Beebe's account of these things is excellent, both clear and readable. His book is a notable contribution to natural history.

Speak to the Earth, by Vivienne de Watteville, pp. x+336, with coloured frontispiece, 16 gravure illustrations, and 2 maps. Methuen, 15/-. This book, as its sub-title explains, deals with wanderings and reflections among elephants and mountains in East Africa. The title itself is taken from the Book of Job, and a fuller extract quoted by the author reveals her attitude better than any other words: 'For thou shalt be in league with the stones of the field: and the beasts of the field shall be at peace with thee. . . . Or speak to the earth and it shall teach thee' (Job v, 23 and xii, 8). Miss de Watteville set out on a five-months' trip to study and photograph wild animals and she tells her absorbing story well. As may be imagined, she had numberless adventures, and she can claim to have succeeded in her difficult aim of establishing almost friendly contact with elephants, lions, and the many other creatures she encountered. The main charm of the book is in its style. The writing is delightful and will hold the reader spell-bound to the end. Once again it is demonstrated that the naturalist-observer has a much more enthralling and informative story to tell than the big-game hunter. The beautiful photographs and the maps are a great help to the reader.

Pigeons and Spiders, by Maurice Maeterlinck. Translated by

The Naturalist

Bernard Miall, pp. 122, Allen & Unwin, 4/6. These two essays are in the authentic Maeterlinck style. That on the water-spider (*Argyroneta aquatica*) is a most vivid account of the life-history of a very interesting creature. Maeterlinck is a perfect observer and misses nothing and his reasoning is always scientific even when it is debatable. The short notes on the pigeon illustrate once more what a lot may still be learnt about the commonest birds; and we are reminded that the homing instinct in pigeons is still entirely unexplained. As might be expected the translation is an admirable piece of work.

NEWS FROM THE MAGAZINES

The Entomologist's Record for May contains 'Depressaria astrantiae Heineman, 1870, an Oecophorid moth new to Britain,' by T. B. Fletcher; 'Noctuae and vars. in 1934,' by A. J. Wightman; 'An account of my studies in the biology of *Pieris rapae*, III,' by O. Querci; 'Two visits to Finland,' by E. Scott (with plate); Notes on Collecting and Current Notes and Supplements; 'British Noctuae,' by H. J. Turner; and 'Butterflies of the Upper Rhone Valley,' by R. Verity.

The New Phytologist for May (Vol. XXXIV, No. 2) contains 'A study on seasonal changes in the acidity of Rhubarb,' by T. A. Bennet-Clarke and W. M. Woodruff; 'New evidence of isospory in Palaeozoic seed plants,' by M. Benson; 'The effect on growth rate of rotating plants on a horizontal klinostat,' by E. D. Brain; 'A discussion of the bearing of morphological concepts on the structure of the stigma,' by H. Hamshaw Thomas; 'A taxonomic revision of the groups of Malvales,' by H. L. Edlin; and two papers on 'The estimation of chlorides in plant tissues,' by Margaret Cattle and E. W. Jones respectively.

The Entomologist for June contains 'A new species of *Aristotelia* (Lep. Gelechiidae),' by G. H. Heath (*A. micrometra* Meyr. n. sp. from Branton, N. Devon, probably on a *Scirpus*); 'Observations on the life-history of *Colias hyale*,' by A. V. Hedges; 'A feeding experiment on the adults of *Pieris rapae* L. (Lepid. Rhop.),' by Mrs. O. W. Richards; 'Superposition of pattern components in a species of amathusiid butterflies,' by B. N. Schwanwitsch; 'A collecting trip in N.E. France, July, 1934,' by A. J. L. Bowes; '*Vanessa atalanta* and other Tenerife butterflies in winter,' by W. G. Sheldon; '*Myelois neophanes* Durrant,' by S. Wakely (from Byfleet, Surrey, and West Wickham, Kent); 'Migration records, 1935,' by Capt. T. Dannreuther; and Notes and Observations.

The Entomologist's Monthly Magazine for June contains 'New species and forms of African Lycenidae (Lep. Rhop.),' by G. Talbot; '*Smicronyx reichi* Gyll., with notes on other species of the genus (Col.),' by K. G. Blair (*S. reichi* bred from seedheads of *Erythraea centaurium* at Eynsford); 'Coleoptera new to Ireland from Co. Kerry,' by E. Bullock; 'The species of *Bembidion* in the Stephens collection (Col.),' by Dr. Fritz Netolitsky; 'What is *Acrydium bipunctatum* L.?' by M. Burr (our common English species is *kiefferi* (Saulcy), *bipunctatum* L. has been recognised in Scotland); 'On the labium of *Locusta migratoria* L.' by Khan A. Rahman; 'Aculeate Hymenoptera from Northants and Wood Walton Fen, Hunts,' by G. M. Spooner (numerous rare species are noted); 'Four days Hemiptera collecting in Suffolk,' by H. R. P. Collett (*Sehirus bicolor* L. associated with Cow-parsley); and 'The parasites of British birds and mammals. IV. Records of bat parasites,' by G. B. Thompson.

The London Naturalist, the Journal of the London Natural History Society for the year 1934, contains numerous interesting articles, among which may be specially mentioned the following:—‘Plant Life in the Alps,’ by J. E. S. Dallas (with plate of Moss Campion, *Silene acaulis* L.); ‘The Story of our Commons, and a Chapter on the Essex Forests,’ by A. L. Simpson; ‘The Hundred of Brixton,’ by W. C. Cocksedge; ‘Brambles of Kent and Surrey (6),’ by W. Watson (a valuable paper giving descriptions and synonymical notes and a description of *Rubus longifolius* n.sp.); ‘Entomology of Yesterday and To-day,’ by L. B. Prout; ‘Noteworthy Plants in the London Area,’ by R. W. Robbins (with plate of *Lastrea montana* T. Moore, in Richmond Park); ‘Notes on the Birds of Edmonton Sewage Farm, 1933-34,’ by E. Mann; ‘Notes on Dragonflies, 1934,’ by E. B. Pinniger; ‘British Butterflies in 1934,’ by H. J. Burkill (*Polygonia C. album* and *Limenitis camilla* have continued to spread round London, while *Argynnis cydippe* and *Leptidea sinapis* have reached places within the society’s area); ‘Flora of the River Mole,’ by H. J. Burkill; ‘Contributions Towards a Study of London’s Starlings,’ by R. W. Hale and F. J. Johnston; ‘Plant Gall Records for 1934,’ by H. J. Burkill (including records of the rare *Andricu xanthopsis*); ‘Birds in the London Area, 1934,’ by C. S. Bayne, R. C. Homes, L. Parmenter, and C. Weeks; and supplement ‘Botanical Records of the London Area’ (Illecebraceæ to Lemnaceæ). The frontispiece of the Stone Curlew or Norfolk Plover is a fine photograph.

NORTHERN NEWS

Mr. William Bean, the well-known Scarborough naturalist and authority on marine mollusca, carefully collected the various reprints of memoirs which had been sent to him by the representative authors, and these he bound in two volumes and carefully indexed them. Most of the reprints bear the signatures of the authors in question, and the collection is an admirable summary of the literature in which Mr. Bean was interested covering many years. The volumes have been presented to the Library of the Leeds University, by Mr. T. Sheppard, and students of the history of this subject may care to know where the volumes are available.

BIRD-SONG AT DAWN.—On June 15th members and friends of the Leeds Naturalists’ Club met at midnight at the foot of Norwood Edge in the Washburn Valley for the purpose of listing the songs and cries of birds in the early morning. The night was a favourable one in every respect and many interesting observations were made. A record was kept by Mr. Clifford Ardill and was as follows: (the times given are ‘summer time.’)—Domestic Fowl, 2-50; Curlew, 2-51; Snipe (notes and drumming), 3-0; Skylark, 3-2; Cuckoo, 3-3; Song-thrush, 3-22; Waterhen, 3-34; Lapwing, 3-40; Blackbird, 3-45; Robin, 3-46; Cock Pheasant, 3-50; Sandpiper, 4-0; Woodpigeon, 4-0; Great-crested Grebe (seen), 4-3; Willow-warbler, 4-10; Wren, 4-11; Chaffinch, 4-15; Tree-pipit, 4-19; Whitethroat, 4-30; Heron (seen), 4-57. Other birds observed later were Swallow, Starling, Magpie, Rook, and House-sparrow. The Tawny Owl and Nightjar were heard throughout the night.

Perhaps the most significant observation made was that the dawn chorus was not made up of the songs of all the birds all the time. At first Skylarks very definitely predominated. Within a few minutes the Skylarks became almost silent, but Song-thrushes filled the gap, to be replaced later by Blackbirds and still later by Chaffinches. During the predominance of one species scarcely any others were heard.—W.R.G.

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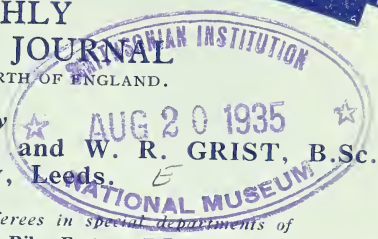
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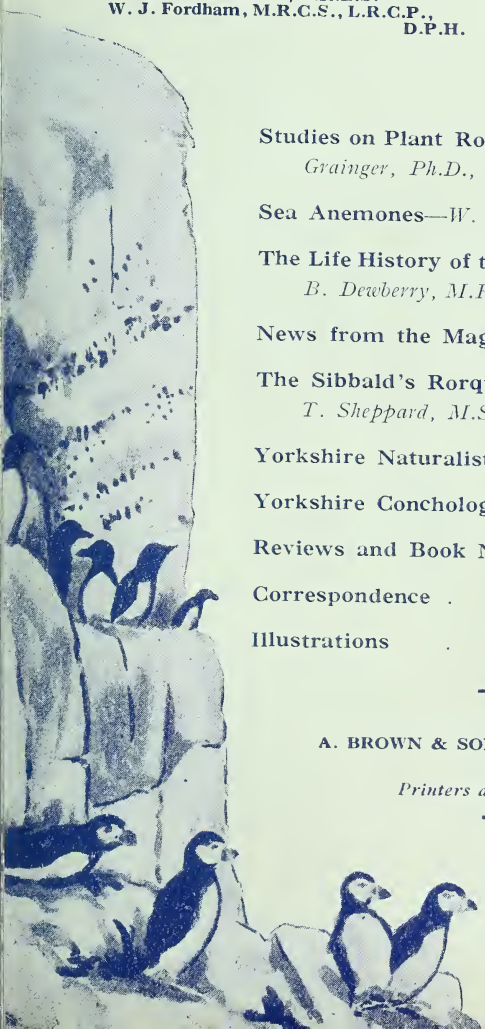
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STUDIES ON PLANT ROOT SYSTEMS

JOHN GRAINGER, PH.D., B.Sc.

THIS paper is written on behalf of the following ladies and gentlemen, who have given most willing co-operation in obtaining the results here reported: Messrs. T. Cock, F. Crawshaw, M. Crawshaw, W. Crawshaw, C. Dyson, L. Garside, A. W. Jury, F. G. Jury, T. Priestley, C. Ridgwick, G. Ridgwick, Miss J. Grainger, and Mrs. Grainger. Excursions to visit Dean Clough, Netherton, near Huddersfield, were initiated at a meeting of the Huddersfield and District Amalgamated Naturalist Societies, of which Mr. L. Garside is Secretary. The laboratory estimations were performed

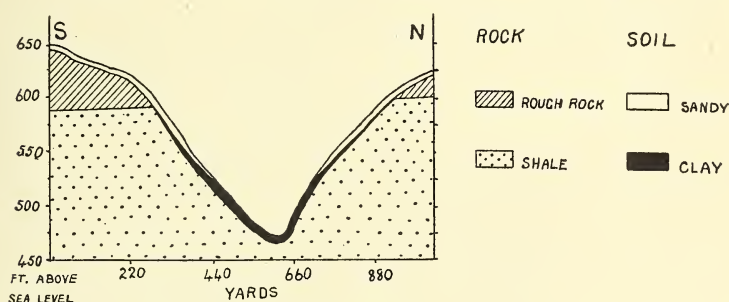


FIG. 1

Section across Dean Clough, Netherton, to show geological strata and soils.

at Ravensknowle Museum, and Mr. G. Sheard helped in their performance.

Dean Clough, or Dean Nick, is a rather steep valley with a small stream. It has cut through the Rough Rock plateau between South Crosland and Crosland Moor, and has carved into the Millstone Grit shales beneath. Rough Rock weathers to a sandy soil, whilst the shale produces a clay soil. Typical mechanical analyses of these soils are:—

	<i>Soil from Rough Rock.</i>			<i>Soil from Shale.</i>		
Coarse Sand	13%	...	...	12%
Fine Sand	74%	...	...	20%
Silt...	9%	...	...	32%
Clay	6%	...	...	37%
Acidity	...	Moderately acid.		...	Moderately acid.	
		Yellow with B.D.H. ¹			Yellow with B.D.H.	
		Soil Indicator.			Soil Indicator.	
Comber's Test ²		Light Red.			Deep Red.	

¹ British Drug Houses, Ltd., Graham Street, London.

² Saturated alcoholic potassium thiocyanate. A red colour indicates a sour soil; a straw colour shows a non-sour soil.

No evidence of any deposit of iron known as a 'pan' has been found.

Although the junction between the Rough Rock and shale occurs high up the sides of the valley, the sandy soil 'creeps' down the slope, and covers considerable areas of clay soil. Indeed, clay only appears at the surface on the lower third of the valley slopes. This state of affairs is typical of most valleys in the Huddersfield district. Springs appear in Dean Clough at the junction of the soils, not where the geological strata change. The dominant plant on sandy soil is Wavy Hair grass, *Aira flexuosa*, whilst Soft Grass, *Holcus mollis*, dominates the clay soil.

PREVIOUS WORK ON ROOT SYSTEMS.

Kolesnikov, a Russian botanist, examined the root systems of apple trees, and produced some rather striking figures about the extent of root systems of young trees. He found that the absorbing parts of a three-year-old tree, if placed end to end, would measure something like a fifth of a mile. He also showed that richness of branching was induced by death of the root tips through lack of nutrients or mechanical damage. Several side roots were formed further back. Rogers and Vyvyan¹ have studied the root systems of apple trees on two types of Paradise rootstocks of different vigour (Malling Types I and IX). They show that the root systems of apple trees extend downwards for nine feet or more unless they are stopped by rock. One-tenth of the total amount of fibrous root was produced in an area one yard square at the centre of the tree, whilst 40% of the fibre was borne outside a circle of diameter 5 yds. with the trunk as centre. Thus it would seem advisable to add manures about 2 yards away from the trunk, rather than immediately round it.

Excavations of the root systems of common farm plants have also been made at Rothamsted Experimental Station, and it is stated that the famous vine at Hampton Court has roots which penetrate to the River Thames, a distance of several hundred feet.

EXCAVATIONS AT DEAN CLOUGH.

It is not always easy to excavate a root system intact; those studied by Messrs. Rogers and Vyvyan took several months of patient labour. Several places in Dean Clough, Netherton, however, afford good opportunities for the student

¹ Rogers, W. S., and Vyvyan, M. C., 'The root systems of some ten-year-old apple trees on two different rootstocks, and their relation to tree performance,' *Annual Report (14th and 15th years) East Malling Research Station*, pp. 31-43, October, 1928.

of root systems. A convenient place for the excavation of *Aira flexuosa* was found at the base of an old quarry tip on the northern slope. An isolated tuft of this grass was selected for investigation, and trenches were dug round it at a distance



[From 'Garden Science for Schools' by kind permission of the University of London Press, Ltd.]

FIG. 2

The root system of *Aira flexuosa* described in text, after washing. Divisions on the scale represent inches.

of about two feet. A few roots from the tuft were found in the soil removed from this trench, but they were not numerous. A little soil was gradually removed from the remaining mass, and then it was lifted bodily on to an improvised stretcher and carried down to the brook, where it was washed carefully

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in slowly running water. By this means, the root system was obtained practically intact. Any detached pieces of root were carefully preserved and added to the whole, which was taken to the Tolson Memorial Museum, Huddersfield, and dried at ordinary air temperature.

The estimation of the extent of the root system presented some difficulty, and it was eventually decided to select a switch of roots, determine its relation to the whole by weighing, and then measure the total length of fine roots in the switch. The total extent of the whole root system could then be calculated. Fine roots in the switch were estimated by counting the numbers at 3 in. intervals from the base of the stems, and assuming that there were so many pieces 3 in. long. This may seem a rough assumption, but it errs on the side of underestimation, for check counts made at $1\frac{1}{2}$ in. intervals always gave a larger number than appeared at the next 3 in. interval. The following data were obtained :—

Total air-dry weight of roots 50·8 grams.

Air-dry weight of switch 6·2 grams.

Therefore the total weight=approx. 8·2 times the weight of the switch.

Distance from the base of tuft.				Number of fine roots.
3 in.	...	...	...	520
6 "	...	...	...	340
9 "	...	...	...	169
12 "	...	...	...	63
15 "	...	...	...	30
18 "	...	...	...	54
21 "	...	...	...	53
24 "	...	...	...	22
27 "	...	...	...	19
29 "	...	...	...	2

Total number of roots each assumed 3 in. long 1272

Total length of these roots, if placed end to end, 318 ft.

The switch has roots of an aggregate length of 318 ft., therefore the whole root system will have a total length of $318 \times 8\cdot2 = 2,607\cdot6$ ft., or nearly half a mile. A small tuft which only occupies an area equal to that of a square of 6 in. side, has a root system nearly half a mile long.

The longest roots did not grow vertically downwards, but grew almost horizontally, owing to the situation on the quarry tip. A plant of Wavy Hair Grass which was found growing on a steep clay slope had a root system which appeared to be quite similar in extent to that from the sandy soil.

Soft Grass, *Holcus mollis*, could not be studied in quite the same manner. It forms no tufts, so it was decided to

estimate the length of rhizome and the lengths of fine root produced by plants covering one sq. ft. of ground space. This area was carefully measured and cut with a knife, and the turf pared off to a depth of 6 in. This included all the rhizomes, which were measured individually after careful washing and drying of the turf. They proved to have an aggregate length of 110 feet. A large block of soil about 18 in. square by 2 ft. deep was then excavated near the stream. This was washed carefully, and a single piece of rhizome from the middle of the block was selected, and removed with its own fine root system intact. All other roots and rhizomes in the block of soil were neglected. The piece of rhizome had a total length of 19½ in., and bore fine roots of an aggregate length of 9 ft. 11¾ in. Some idea of the amount of fine root borne by the rhizomes in one square foot can now be obtained.

If 19½ in. of rhizome bear 9 ft. 11¾ in. (say 10 ft.) of fine root, then 110 ft. of rhizome bear approximately 660 ft. of fine root.

This is rather a contrast to the root system of Wavy Hair Grass, which occupied a quarter of the ground area, and had a root system four times as extensive. It may be said that the root system of *Aira flexuosa* is sixteen times as extensive as that of *Holcus mollis*, per unit of ground covered by the above-ground parts. There is, however, no comparison between relative density of foliage in the two cases.

It was observed that most of the fine roots of Soft Grass ramified in the surface layers of soil, along with the rhizomes. Samples of soil were taken at various depths, and the amounts of moisture and organic matter in each were determined. The fresh weight of each sample was obtained, and the preliminary drying performed, in the field.

Depth of sample.	Percentage (of fresh weight)	
	Percentage of water.	of organic matter.
Surface.	55	29
6 in.	21	4
12 „	16	4
18 „	21	6
24 „	16	5

These results show that high water content goes along with high organic matter content and *vice versa*. The high percentage of water in the surface layer may account for the good development of roots in that region. Rogers¹ publishes results which suggest that there is a close correlation between water content of the soil and the amount of root growth.

¹ Rogers, W. S., 'Root Studies IV,' *Annual Report* (21st year) *East Malling Research Station*, Kent, pp. 86-91, 1933.

SEA ANEMONES ¹

W. LAWRENCE SCHROEDER

WHEN I was a boy—fifty years or more ago—one of my chief delights was to visit, on a Saturday morning, the basement of the Brown Museum, Liverpool, where the small aquaria were. Saturday was a school holiday, and my journey to the Museum was due, partly, to the intense desire of the elder members of my family to have me ‘out of the way.’ It was great fun to watch the fishes in their restricted containers twisting and twirling about; a sinister-looking pike with ugly jaws and a resentful expression was one of my favourites; literally he was a thrilling object, for when he set his eye on me, I felt glad he was where he was.

But the case where I lingered longest was that wherein the sea anemones were—so-called from their resemblance to the wind-flowers of our gardens. The Germans liken them to roses: we speak of them as the Anthozoa—the flower animals: and certainly the cases o’er which I hung in almost breathless admiration, seemed as gardens of the sea, full of colour and delicacy of form, fascinating both in the quiet reserve and gentle movements of their inhabitants.

It was many years before I was fortunate enough to see the creatures in their proper habitat: but now an essential part of my summer holidays is spent poring over and searching the rock-pools to be found on the southern side of the Isle of Man: pools full of treasures for the microscopist, and not without significance for the hunters after larger game.

And then there is the Port Erin Biological Station, where in splendid array may be seen specimens of the Anthozoa—dahlia wartlets, sand pintlets, snakelets, cloaklets and the common beadlelets. Once I saw there a curious blue *Metridium dianthus*: my mind was troubled until on inquiry I learned that one of the station workers had been experimenting with a dye. The creature was removed—the anemone, not the student.

For many years, the best and most attractive book on the subject was Philip Henry Gosse’s *History of the British Sea Anemones and Corals*. It was a carefully written work, dealing with seventy-five species—fifty-four of which had been examined by Gosse himself: and of these, thirty-four had been added to the British Fauna by the author. The coloured plates, from the original drawings by Gosse, were marvellously beautiful—an adequate guide to genera. The

¹ *The British Sea-Anemones*, Vol. II., by T. A. Stephenson, D.Sc., Professor of Zoology, The University of Capetown, published by The Ray Society, 37/6.

accounts of species were charmingly rendered, with personal allusions and homeliness of communication that forbade the very notion of science high and dry. And yet the science was there, based on actual contacts with the creatures described and formulated in clear and convincing fashion.

In 1928 came the Ray Society's publication of the first volume of *The British Sea Anemones*, by Dr. T. A. Stephenson, then in the Zoology department of University College, London. Between Gosse and Stephenson, work had been done on the British Actinians by A. C. Haddon, G. C. Bowne, C. L. Walton and others.

Stephenson's volume gave what he called a 'Preliminary Account,' in which structure, coloration, development, bionomics and classification were expounded. The line drawings, in the text, helped to elucidate the exposition. The plates, most of them exquisitely coloured, were, in themselves, a delight: while the head and tail pieces—of fancy all compact—were a joy to contemplate. I fell in love with the sea-fairy tickling the centre of an anemone with a stalk of *Laminaria*.

Now has come the second volume, completing the work. Over 400 pages of text, with adequate indices and additions to the bibliographical information given in the first volume, place all students of the Actinians in deep obligation to the author. There is a section on the classification of nematocysts, a guide to the identification of species, and remarkably detailed descriptions of the species. Drawings in the text—many of them sketches from life; with plates coloured and plain, some of them amazingly taken photographs, help us to realise that with Dr. Stephenson as with his predecessor, Philip Henry Gosse, the work must have been a labour of love.

Anemones are widely distributed: they reach their most elaborate development in tropical waters; they are almost exclusively marine, though a few may be found in brackish waters. They have been taken from a depth of 2,900 fathoms.

Habitats vary: *Zostera* beds on mud-flats; sand-flats; rock-pools; the undersides of stones; crevices in the rocks; holes and crannies among the boulders; the root-like attachments of *Laminaria*. Their movements are slow, mainly by the creeping of the base: but many adult forms settle themselves in one place and abide: a few small forms swim by a lashing of the tentacles. The more rapid movements are of the retraction of the tentacles, and the contraction of the column. They eat almost anything that comes their way—crustacea, fishes, worms, and even their own kind: but they can live for a long time without food, becoming slimmingly less and less as the starvation period

continues. Food is usually caught by the tentacles and transferred to the mouth; but the process may be more direct. Mouth and throat can conveniently gape for the accommodation of the larger elements. The closing-up of the anemone is not necessarily after food has been taken.

Reproduction may be sexual or asexual, by ova and spermatozoa; or by fission, longitudinal and transverse; or by fragmentation, when a piece separated from the edge of the base, grows the missing tissues and becomes a complete creature. Occasionally double anemones may be found—with separate bodies, mouths and discs, but with a common basal column. They may live to a very great age: Dr. Stephenson suggests that in the wild, and under suitable conditions, they may live for hundreds of years. Specimens in captivity have topped the Psalmist's three score and ten.

The Coelenterates are a fascinating group, and of them the Actiniaria are the most beautiful. To watch, as I have, the emission of the young beadlets from the mouth of the parent, is thrilling: to note the slow movement of a specimen along the glass side of the aquarium is to understand the realization of the Hore-Belisha ideal.

All who desire to be in touch with the latest findings on the subject; all who delight in the possession of beautiful books, well printed, well illustrated, packed with scientific information set out in an attractive style, will desire to have these volumes issued by the Ray Society at the comparatively moderate price of thirty-seven and sixpence each, net. Dr. Stephenson may be happy in the consciousness of a fine piece of work well and truly accomplished. For twenty years he has laboured: the result has been well worth while. I find him symbolised in the tail-piece, where the sea-fairy reclines on a bank idly pouring sand on the disc of an anemone, heedless of the shocked accusing expression of a fish that must be nameless.

NEWS FROM THE MAGAZINES

The Entomologist's Record for June contains 'The Entomology of a Heron's Nest,' by H. Donisthorpe; 'Cornish Notes for 1934,' by C. Nicholson; 'An Account of my Studies in the Biology of *Pieris rapae*, III,' by O. Querci; 'Notes on a Visit to Northern Natal and Zululand,' by J. S. Taylor; 'Notes on Collecting, etc,' including 'Micro-larvæ for the Month of June'; 'Current Notes and Short Notices'; and supplements 'British Noctuæ,' by H. J. Turner; and 'Butterflies of the Upper Rhone Valley,' by R. Verity.

THE LIFE HISTORY OF THE OYSTER

ELLIOT B. DEWBERRY, M.R.I.P.H., M.R.SAN.I., M.S.I.A.

HISTORICAL

OYSTERS are said to be the aristocrats as well as the most ancient and famous of all shell fish, and their ancestry can be traced back into the dim recesses of early history. We know that oysters were eaten by primeval man, because large numbers of their shells have been found buried with the stone axeheads and flint instruments discarded by the ancients. Such accumulations of shells in the kitchen middens of neolithic age certainly proves that the appreciation of oysters is no modern taste. Further evidence of this is shown by the fact that early British and Saxon graves contained necklaces of the shells strung together on fibre or sinews.

The Romans consumed large quantities of oysters, and also gave considerable attention to their cultivation.¹ Horace, Cicero, Seneca, Pliny, and other ancient philosophers and writers enlarged upon the various qualities and properties of this bivalve as an article of diet. Pliny relates that Sergius Orata was the first to introduce the artificial cultivation of oysters, and established beds at Baiae, the Brighton of ancient Rome, about the year 95 B.C. He, too, was the first to adjudge as pre-eminent in delicacy of flavour to the oysters of Lake Lucrinus, in which lake he relaid those he imported from their natural beds at Brindisi.

Oysters were exported at great expense and trouble during the Roman occupation of Britain (78 B.C.) from the Reculvers in Kent to Rome, where they were served at banquets in honour of various conquests. The shell fish were transported in bags and tightly packed with snow and ice, which not only preserved, but also prevented them from opening and enabled sufficient moisture to be retained in the shells to keep them alive.

According to historians, oysters were occasionally used by the Empresses of Rome—who were not always the most devoted and virtuous of wives—as easy and agreeable agents in which to administer poison to their husbands and lovers. This method was doubtless preferred because the molluscs enjoyed a reputation among Emperors, and being served at all the great Roman feasts, were consequently regarded as above suspicion. J. M. Tabor says : ‘ It has been suggested that the fame of the British oyster was a deciding factor in the mind of Cæsar when he set out on the conquest of Britain. If so,

¹ It is believed that artificial oyster beds were formed in China long before they were known to have existed amongst the Romans, and that the Chinese have been obtaining good results for the past 1,800 years.

we have to thank oysters for much of the civilisation of our Islands.' It is a noteworthy fact that Roman remains in England are largely concentrated round the oyster beds of Kent, Sussex and Essex. Quite recently a large number of the shells were discovered in the vicinity of the remains of a Roman villa excavated near St. Albans (Verulam).

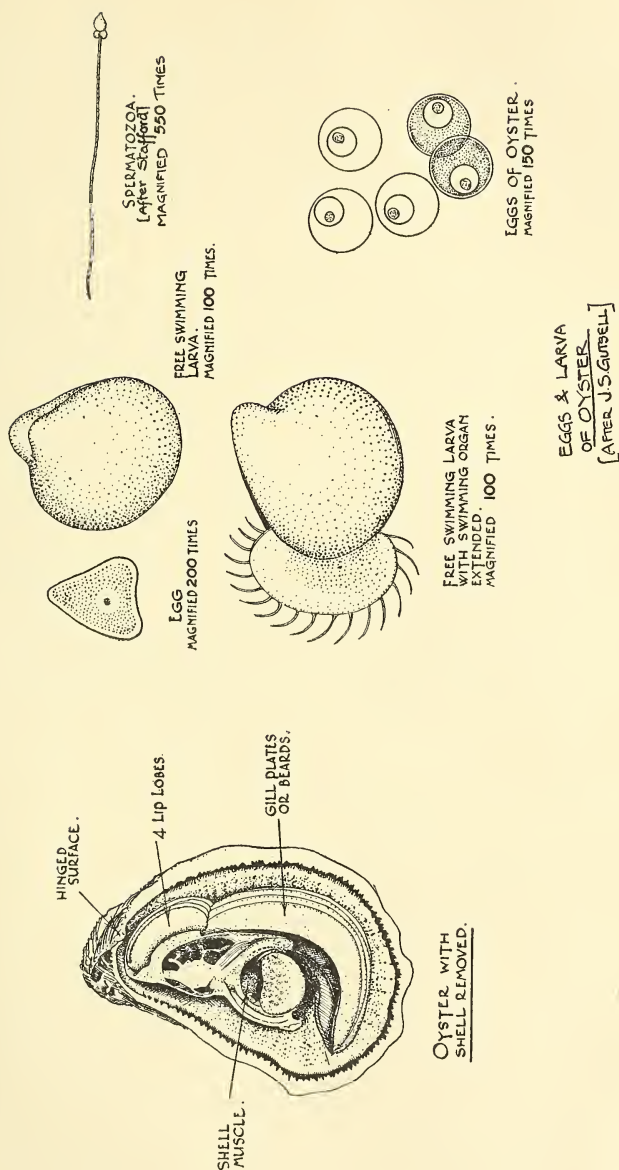
Oysters have been esteemed a luxury throughout history, and this is easily understandable, as when in first-class condition these delicate, nourishing and succulent molluscs, with their mysteriously attractive flavour and their delightful effect on the palate, afford very great pleasure to those who can afford to buy them. A luxury they are nowadays, as oysters are comparatively dear and scarce.

VARIETIES OF OYSTERS

There are several varieties of oysters, but the favourite is undoubtedly the small English native (*Ostrea edulis*) which comes from the beds at Whitstable, Brightlingsea, Bosham, Burnham, and Falmouth, etc. Owners of oyster beds name the bivalves by the locality in which they are situated, consequently we hear of Blue Points, East Rivers, Callies, Alfords, etc.

Oysters are imported in large quantities from Portugal, France, Holland and America, and the scarcity of English natives has caused a substantial increase in importations during the past few years. A considerable proportion of those from Holland, America and France are sold for immediate consumption, but all the Portuguese (which have a very rough and wrinkled shell, the bottom half being very deep) and quantities of American Blue Points (a larger oyster than the native), Dutch and French oysters, are relaid in the beds at Whitstable and elsewhere to grow and fatten. Imported oysters are sold in the markets all the year round, but the sale of the English native is regulated by the Act of 1877—the close season being from May 14th till August 4th, and for deep sea oysters from June 15th till August 4th. The Whitstable and other companies, however, voluntarily extend their close season until September 1st. In Ireland the close season is from May 1st to September 1st.

English oysters were very cheap years ago and formed a nourishing food for our forefathers. In the year 1388 they were offered for sale near Whitstable at 8d. per bushel, and during the period 1800-1834 Colchester oysters could be purchased in the streets of London at from 8d. to 1/- per dozen. In recent years English natives have gradually become scarcer, owing to a series of summers unfavourable to oyster breeding and to over-dredging. A mysterious mortality also occurred during the years 1920, 1921 and 1922, which caused a very



severe loss to the oyster industry. Now one has to pay from 4/- to 8/6 per dozen for them at the best London restaurants. Imported oysters are, of course, cheaper, and are retailed at from 1/6 to 5/- per dozen. The warm weather of 1934 has, however, been more favourable for breeding purposes, and there has been a better fall of spat, or young oysters, than for several years past. It takes from four to five years for oysters to grow to maturity, and it will, therefore, be some time before the market will feel the benefit of these improved conditions.

LIFE HISTORY

The life history of the oyster is of fascinating interest to all lovers of natural history, because the more its complicated and delicate structure is studied the more the desire for further knowledge of the subject increases. The oyster is a mollusc or shell fish protected by an upper and under shell and has no means of locomotion or internal skeleton. It is found in estuaries such as the Thames with its creeks and protected bays, and minor river mouths, and flourishes on muddy or gravelly and sometimes sandy beds. It is generally found at levels varying from those of the low spring tides to a depth of a few fathoms. It does, however, sometimes live in deep water in the English Channel, the North Sea, and off the Irish Coast, but in these situations it is not of much economic value on account of the difficulty in dredging. The most important conditions affecting the life history of the oyster are the temperature and saltiness of the water, and the food supply. The saltiness or density of sea water as measured by a hydrometer ranges from 1.025 to 1.026 (fresh water 1.000), and brackish water may give any intermediate reading. Generally speaking, English oysters seem to thrive best in densities between 1.015 and 1.045, which occur in harbours, bays, river mouths, and partially enclosed waters made brackish by the draining of fresh water from the land. A density of 1.023 is considered by the French to be very favourable for development of larvae and the setting of 'Spat.'

The average size of the oyster is about 3 inches in diameter and the fish varies in shape and colour. The shell, which is composed of 96 per cent. to 97 per cent. of carbonate or lime and animal matter, is tinted to match the colour of its natural surroundings. The upper shell is flat and marked by regular crescentic lines, the under shell being coarser, stouter, convex externally and concave internally. The shells are united at the narrow end by a dark coloured elastic-like internal ligament which acts as a hinge, contracting to allow the shells to come together. A very strong muscle (adductor

muscle) situated near the centre and attached to both upper and lower shells causes them to close tightly at will. When the oyster is dead the adductor muscle does not act, in which case the hinge ligament expands and the valves gape. The oyster normally rests on the flat right valve on the sea bottom with its valves open a short distance for respiration and for the purpose of obtaining nourishment, but in the event of any violent disturbance in the surrounding water the adductor muscle immediately functions and the valves close tightly.

The oyster is covered with a delicate integument or mantle, which extends beyond its body to the limits of the shell, and when the valves are open this is seen as an irregular fringe. The edges of the mantle have pigmented spots (double row of papillæ) termed the visual organs. These organs are not, however, eyes in the ordinary sense, although they are sensitive to light and enable the oyster to sense danger. The margin of the mantle is the agent in enlarging the shells, and is furnished with glands which deposit a secretion of calcareous material (organic matter and lime salts). This is deposited layer upon layer, and the shell is thus not only increased in thickness and weight, but the circumference of the shells is also progressively enlarged. The oyster is held in place by the adductor muscle and the mantle.

Within the folds of the mantle are seen the gills (grid-like structures) which appear as four leaves. The gills fulfil important functions in the economy of the oyster, as, in addition to functioning as breathing apparatus, they act as a pump, food collectors and transporters. Each leaf consists of two thin semi-transparent plates or laminae, joined below to form the edge of the leaf, while the upper portion is united to the opposite lamina forming chambers or tubular cavities within the gill plates. The gill plates are covered with minute, soft, sensitive hairs (termed 'cilia') which lash horizontally, beating rhythmically in sets and causing continuous currents of sea water to be drawn into the lower shell-space (inhalant chamber), and thus bathe the surface of the oyster. The water is driven through the small cavities of the gills and flows out of the upper shell-space (exhalant chamber). The stream of sea water not only aerates and purifies the blood, but is the sole means of supplying the animal with food. Particles floating in the water are arrested on the surface of the gill and transported along the branch to the main channels where an adhesive mucus exudes and mixes with the food which the large cilia mechanically roll up and slide along towards the mouth of the oyster. This is situated in the narrowest part of the animal's body and bordered by four thin short lips or palps covered with countless

cilia, which waft or slide the food particles into its ever-open mouth. Unsuitable food is rejected and passed on to the mantle to be eventually blown out of the shell with the excrement.

The English native oyster is small, and when in good condition is firm and of a creamy-white colour. In the body are the oesophagus, stomach, heart, short intestine, and a large digestive gland (liver) of a greenish or dark chocolate colour. All these organs are bound into a whole by muscle fibres and connective tissue. The ovaries are spread throughout almost every portion of the viscera, and in the spawning season the body of the oyster assumes a veined or mottled appearance, the distended ovaries showing through the integument. Although the bivalve has no eyes it may be said to have a delicate and sensitive sense of smell and touch.

FEEDING

The food of the oyster consists of microscopic animal organisms floating or swimming in the sea; minute plant life (diatoms and peridians), which is produced under the influence of sunlight and always found in waters whether fresh or salt, and the spores and detritus of seaweeds. It is generally held that it is this particular food which makes the oyster so rich in vitamins, phosphorus and iodine, which are so essential to the health and nourishment of man. The nitrogen in the oyster is good for the brain and nerves, and the minute quantities of metals, including iron and copper, which are found in the mollusc, add a certain tonic value. The copper activates the iron and promotes the formation of hæmoglobin, thus making the blood red and assists in preventing anæmia. The liquor of the oyster is rich in the salts of magnesium, lime, potash, and soda, all of which are beneficial to health.

The bluish-green colour of the Essex and French (*Marennnes vertes*) oysters is due to their feeding on a certain coloured diatom (*Navicula ostrearia*). The green chlorophyll is digested and the soluble colouring matter passes into the circulation causing the gills, or beard, to assume a rich blue-green colour. If, however, the oysters are placed in ordinary sea water for a few days the colour disappears. Oysters do not feed unless they are in their natural habitat and the temperature is above 40° F. They do not feed during the whole of the day, nor at certain times of the year; little feeding occurs in the late autumn and winter months.

REPRODUCTION

The onset of spawning varies with the temperature, but

usually takes place in the summer from June to September, when the temperature of the water reaches 59° F. Oysters after spawning are in poor condition and quite unfit for consumption, but a fattening stage follows in the autumn or early winter and the oysters are, therefore, in the best condition for eating in the winter and early spring.

Research has shown that the sexes of the British oyster are not separate, the male spermatozoa as well as the female ova, or egg-cells, being produced from the same gland. The two reproducing elements are, however, developed at different periods, and so are not brought into contact within the body of the same individual. The egg cells formed in one oyster require to be fertilised by the male sperm produced and discharged into the sea by another oyster. About a fortnight after fertilised eggs have been shed the same oyster produces spermatozoa which, in clouds of millions, are discharged into the sea. Some of these spermatozoa are carried into the gaping shells of neighbouring egg-bearing oysters by the currents produced by the minute hairs (cilia) on the gill plates, and thence into the tubular sacs containing the eggs which are then fertilised.

The fecundity of a single oyster is amazing and may produce anything from 300,000 to 1,800,000 young, but, unfortunately, few reach maturity. The fertilised eggs, which in the early stages consist of minute oval clusters of globules floating in a transparent fluid, are retained and developed within the shell of the oyster. They pass from the ovary and adhere to the gill plates and folds of the mantle, being cleansed and nourished by the ceaseless stream of sea water passing over them, and are hatched. During this period the parent oyster is termed 'white sick.' As development proceeds the embryos are provided with a circlet of cilia (velum) at one end—for swimming purposes—and their bodies also become pigmented in parts and assume a grey colour. The colour, however, darkens considerably as growth of the internal organs proceeds. Later, the embryos become furnished with a pair of delicate symmetrical cockle-shaped shells, which are so constructed that they allow the embryos to protrude or withdraw the ciliated swimming apparatus at will. The parent oyster at this stage is called 'black sick.'

In the course of a week or so the young fry are ejected from the parent shell into the sea in thousands. Each of these semi-transparent active organisms is about 1-150th of an inch in length. The dark brood floats or swims towards the surface of the water and is carried by the wind and tide in all directions. More often than not they fall a prey to fish, mollusc, or crustacean, especially the last named, which eat enormous

numbers, or they die through lack of suitable food. Small fish and shrimps frequently lie under the shell of a breeding oyster ready to devour the larvae as they are ejected. After a short interval, varying from a few days to weeks, the larvae has grown considerably, and owing to the increased weight sinks to the bottom of the sea. If it drops on to soft and slimy mud, to which it cannot attach itself, it perishes, and, in fact, more than half die through landing on unsuitable ground. Should, however, it fall on to a clean hard substance it becomes attached to it by exuding a kind of cementing material from the edge of its under shell. It is now termed the 'spat.' Suitable temperature and calm conditions are important factors in the proper deposit of spat. As soon as the spat becomes firmly fixed it loses its swimming apparatus and begins to grow rapidly, changing its shape to, and feeding like its parent. It increases from 1-40th to 1-20th of an inch in diameter to the size of a threepenny piece in from five to six months, and in a year has reached one inch in diameter. In three years time it is about three inches across, but after this growth is much slower and the shells increase in thickness rather than in circumference. The oyster commences to breed at the age of two years, but it is not until it has reached the age of five to seven years that it becomes perfection for the epicure. The various stages are called the spat, brood, half-ware, and ware or oyster, a year marking each stage. It is considered a good breeding season if the fall of spat results in an average of four survivors out of every million.

The American (*Ostrea virginiana*) and Portuguese (*O. angulata*) oysters differ from the British in the method of reproduction, as there are two distinct sexes. The female discharges her ova into the sea, and these are fertilised by the spermatozoa discharged by the male oyster. These discharges may be compared to puffs of smoke, and are estimated to contain 800,000 to 1,000,000 organisms. There is no incubation period, and if the ova do not meet the fertilising male sperm they perish. It is held that not more than one young oyster in every million survives to reach maturity. American oysters rarely spawn in this country as they require sea water at a temperature of about 70° F.

NATURAL ENEMIES

The oyster has numerous natural enemies, among whom are the starfish, sea urchin, crab, prawn, mussel, boring whelk, skate, ray, cuttle-fish, snail-like molluscs and burrowing worms. The common five-finger starfish not only devours the young, but also attacks and eats the full-grown oyster. Starfish are, therefore, a pest to the oyster culturist.

The spat of mussels also gives considerable trouble through settling on the oyster shells and necessitating the oysters being removed and cleaned.

OYSTER CULTURE

Careful cultivation of the oyster, which now receives considerable attention, is necessary in order to prevent contamination and to produce first-class shell fish. The principle of oyster culture has, however, altered little in spite of the antiquity of the industry. The foremost requirement in the selection of a location for successful oyster culture is clean well-aerated brackish water, changed regularly and completely by the tide. With regard to the depth of sea water, the oyster beds at Whitstable are always under water, the greatest depth at any tide being from 30 to 40 feet, and the least 10 feet; these beds are very carefully prepared and maintained. The oyster beds at Brightlingsea, however, are situated in a creek and at low tide the edges of the oyster layings are exposed, although in the channel the water is from one foot to ten feet deep. At high tide the depth is from 15 to 30 feet deep. Further, the beds should be as free as possible from sand and mud, as a soft bottom allows the shells to sink so that the oysters are smothered. Shifting sand will also destroy them.

The modern oyster farm is laid out somewhat on the lines of an agricultural farm. A portion of the area, which is considered most suitable for growth and fattening, is divided into numbered parcs or squares, each square being marked by a buoy. A plan is made of this area. The oysters are sorted and relaid in the various numbered beds, according to age and size. It is, however, necessary in relaying a stock of brood oysters that they should be in close proximity to each other to ensure a plentiful supply of spermatozoa finding access to the bodies of the oysters containing egg cells to be fertilised. In the fattening of oysters, however, they should be spread as sparsely on the ground as is consistent with the extent and capacity of the bed.

The important question of suitability and sufficiency of food must always be an anxious one for the oyster culturist. However rich the vegetation may be, it varies with the temperature and the amount of sunshine which obtains in various parts of the beds. This fact necessitates the regulating of the number of oysters to the best parts of the feeding ground and thinning them out when there are signs of insufficient plant food. On the other hand, the beds must not become overgrown with weeds.

During the summer preparations are made to ensure that a plentiful supply of clean 'culch,' (as the material is called),

is provided to secure the successful adhesion of the spat. This culch consists of clean hard material, such as oyster, cockle, or mussel shells, which have been sterilised or bleached in the sun. During the breeding season the culch is thrown into the sea in very large quantities, two or three times a week, to provide material suitable for the spat to attach themselves. A bed on which culch has been placed for several years in succession will gradually be made firmer by the settling of a part of the shells.

Many materials have been used as culch, from bundles of wood to shells, stones, slates, tiles, etc. A special 'V' form of inverted tile has been used with success, especially in France. These tiles are coated with thin layers of cement and sand. The spat adhere to the coating and can be easily detached by chipping.

Experiments on the artificial breeding of oysters in tanks have been carried out by the Ministry of Agriculture and Fisheries during the last ten years and have been attended with considerable success, though the factors which determine a successful spat-fall will required further experimentation for their full elucidation.

The Fishmongers' Company, which has done so much for the oyster industry, make themselves responsible for taking and testing samples of oysters sent to the London markets. The beds in which the bivalves are reared and fattened are examined by the company's inspectors, and oysters from beds suspected of being polluted are subjected to bacteriological examination. The company does not hesitate to stop the sale of oysters from beds which do not comply with the bacteriological standard which it has established. Oysters from contaminated beds may, however, be relaid for a specified period in beds of recognised purity in order to cleanse themselves, afterwards sale is permitted.

Sanitary surveys of shell fish beds are carried out by the Ministry of Agriculture and Fisheries. If serious pollution be found the polluted beds are closed by the issue of an appropriate order by the Ministry of Health.

THE COMMERCIAL PURIFICATION OF OYSTERS

The experiments on the purification of oysters, which have been carried out at the Fisheries Experiment Station (Ministry of Agriculture and Fisheries), Conway, North Wales, under the direction of Dr. R. W. Dodgson, have now resulted in the construction of a plant at Brightlingsea, Essex, for the commercial purification of oysters. The treatment, which has been successfully applied to mussels for nearly twenty years at the commercial installation at Conway, is based on the natural action of the bivalves in clearing their alimentary

canals freely in sterilised sea water and thus gradually becoming cleansed. The bacteriological examination has demonstrated that the oysters are freed from possible contamination and are clean and above suspicion to be placed on the market. Every package of oysters is 'sealed' before being allowed to be despatched to market, this seal being practically a government certificate of purity.

PACKING AND PRESERVATION

The oysters taken ashore from the beds are examined and sorted, the smaller are returned to the beds. They are then scrubbed and washed. Those sent to market are tightly packed in barrels or baskets (kits) with the deep shell downwards, the lid of the barrel resting upon the oysters. Packed in this way they will keep fresh from six to eight days. Oysters will remain alive in cold storage and survive long shipments if packed in barrels immediately after being taken from the beds and placed in refrigerating chambers at a temperature of 35° to 40° F. They must not, however, be frozen. The commercial canning of oysters is an industry carried out in America, especially in Baltimore.

Oysters are not improved by being placed in tubs of salt water, but can live for some days perfectly dry if packed tightly together in a cool place with the deep shell downwards. They, however, gradually lose their freshness and soon begin to smell owing to the decaying minute animal life which adheres to the outsides of the shells. The shells of a healthy oyster should be tightly closed. Even if the shells gape but slightly it is a sign that it is losing its freshness. The shells should, however, close up on being handled, otherwise the oyster is dead and unfit for food. It is essential, from a health point of view, that oysters should be eaten in a perfectly fresh condition, *i.e.*, as soon as possible after they are opened.

The esteem in which the oyster is universally held as a delicate food is indicated by the numbers brought to market. During 1933 the number and value of oysters of British taking landed in England and Wales was 107,192 hundreds, to the value of £96,255, and the quantity and value of those imported into the United Kingdom during the same year was 25,794 cwt.s.=£83,967.

We have received from Mr. Hans Schlesch a reprint from *Archiv für Molluskenkunde* entitled 'Eine neue Subspezies von *Bulimulus (Bulimulus) sporadicus* Orb. aus Paraguay (*Bul. sporadicus* Schadei).' This illustrates some extraordinary deformities of *Planorbis planorbis*.

THE SIBBALD'S RORQUAL OF THE HULL MUSEUM

T. SHEPPARD, M.Sc., F.G.S.

IN *The Naturalist* for August, 1901, I described the skeleton of the type specimen of Sibbald's Rorqual which has now been in the chief museum at Hull for ninety-nine years. The animal was washed up at the mouth of the Humber in 1835. In re-arranging the specimens in order to distribute them among the various museums, it was desirable to have the skeleton of the whale, with other objects of a similar nature, in the Museum of Fisheries and Shipping at the west end of the city. Difficulties arose, however, in consequence of the brittleness of the skeleton due to its great age and the cost of transport. Now that the British Museum (Natural History) has a special section devoted to whales, the authorities there agreed that it was desirable in the interests of students that the type specimen should be in London, and to this I agreed, the condition being that we should have a skeleton of a somewhat similar size in exchange. During my absence abroad it seems a suitable skeleton was available at Cambridge, and as the question had to be dealt with promptly, Professor A. C. Hardy, of the University College, arranged for its removal to that institution. On arriving there, however, there was not enough room for its proper exhibition, and ultimately the authorities at the Natural History Museum agreed by arrangement with Professor Hardy to prepare and exhibit this specimen in our Fisheries and Shipping Museum and take in exchange the skeleton of Sibbald's Rorqual. Messrs. E. Gerrard & Son, the well-known naturalists and taxidermists, removed the skeleton to London, where it was properly prepared and articulated, and it was then brought to Hull and hung from the roof at the Museum of Fisheries and Shipping. Sibbald's Rorqual was taken from its somewhat incongruous surroundings in the Albion Street Museum and is now resting in the Natural History Museum, London. As a matter of quick transport, it may be interesting to record that Sibbald's Rorqual was dismantled and placed on a van on Sunday; it was delivered at the Natural History Museum on the Monday morning; the skeleton of the Southern Right Whale received in exchange was packed on the van on Monday afternoon, and on Tuesday morning the men were busy placing it in position at the Hull Museum, where it can now be seen.

Other whale skeletons in this museum are the Bottle Nose Whale, Lesser Rorqual, Narwhal, Dolphin, and Grampus.

The small skeleton of the Narwhal is interesting as it possesses two tusks instead of the usual unicorn, though one of them is not fully developed. Incidentally I might mention that the reprint of my notes on the skeleton of Sibbald's

Rorqual which appeared in *The Naturalist* was *Hull Museum Publication No. 1*, and since then nearly 200 publications of a similar character have been issued, as well as several guides to the different museums, some of which have reached seven or eight editions.

YORKSHIRE NATURALISTS AT TANFIELD

THE meeting in the North-west Vice-County was held on May 11th, at Tanfield, on the north bank of the River Ure, which is the southern boundary of this area. Across the river lie the well-known Hack Fall woods which have a rich and well-known flora; the woods on the north bank are kept private and consequently are little known, though our Union has been permitted to visit them on two previous occasions. On this occasion we were helped in the arrangements by Miss C. Rob, of Catton, who also acted as leader.

The river side by the village is botanically interesting, and was well known and well worked by the late T. J. Foggitt and also by his father. Here many members saw Hawthorn in flower for the first time this year.

Vertebrate Section : Mr. H. B. BOOTH writes : The ornithologists present had a good time amongst the commoner birds and their nests, and saw several summer migrants for the first time this season. One of their chief pleasures was in watching two (or probably three) male Pied-flycatchers in full song. A pair of Wood-warblers were watched love-making, and a Woodcock was flushed. The Green Woodpecker was heard, and an occupied nesting site of the Greater Spotted Woodpecker was found. A lady member reported that she had twice seen the Lesser Spotted Woodpecker 'drumming' in the same place. The British Marsh-titmouse was clearly identified. The Nuthatch and the Kingfisher were not seen, although carefully looked for in several suitable sites, more especially for the latter.

In mammals a distinguished visitor attended the meeting in the shape of a young Badger that had been dug out of a local 'earth.' As its age was generally agreed to be about two months, it had therefore been born early in March. It was a perfect *facsimile* of its parents excepting in size. When its owner was asked what he fed it on, he replied 'On rabbits.' We had expected that he would have said that he gave it at the least a generous milk diet.

One British Squirrel was seen alive, and four or five N.A. Grey Squirrels were hanging up dead in various places, though none were seen alive. Several fine trout were seen in the river, and these were the only fishes noted.

Entomologically the most interesting and at the same time most irritating, dipteron was the Sand fly, *Simulium reptans* L., it was present in countless myriads but though much annoyed I heard of no definite cases of bites. This is the first time I have met the species in such numbers. The mosquitoes *Anopheles plumbeus* Sph. and *Ochlerotatus nemorosus* Mg. were caught but not troublesome. St. Mark's fly, the white-winged fly with large black body seen about the hedgerow, *Bibio Marci* L., also *B. ferruginatus* L. and *Dilophus febrilis* L. were noted. There were a few fungus gnats, *Mycomya ornata* Mg. *Rhymosia macrura* Winn. and *Macrocera angulata* Mg. and some Limnobiids, *Limnobia nubiculosa* Mg., *Ormosia lineatus* Mg., *Erioptera tenionota* Mg., *Pacilostola punctata* Schr., *Molophilus obscurus* Mg., with *Tipula hortulana* Mg. Syrphids were few, *Platychirus immarginatus* Ztt. and *Melanostoma*

scalare F. Two others worth noting are the gall maker *Tephritis leontodontis* De Geer. and *Sciomyza schænherri* Flin.

Mr. ROSSE BUTTERFIELD writes: Though it was a fine sunny day I did not expect to find much in the way of Entomology as the wind was from a cold corner. A few Orange tip butterflies, both sexes, were on the wing, and the Tortoiseshell, *Vanessa urticae*. Towards mid-day in the warm sunshine some Spring *Aculeata* became fairly active on a sandy slope near the left bank of the Ure. Of the species taken or noted are the following:—*Andrena albicans*, *A. trimmerana*, and *A. Clarkella*. *Nomada bafida*, *N. ruficornis*, and *N. alterata*. *Formica fusca*, and *F. flavus*. *Myrmica rubra*. *Psithyrus distinctus*. *Bombus terrestris*, *B. lapidarius*, *B. hortorum*, and *B. muscorum*. *Vespa norvegica*.

Mr. J. M. BROWN writes: Owing to late arrival only a short time could be devoted to working the woods for insects, hence the following notes can only be regarded as the results of a very cursory survey. Most of my time was spent by the river side, and what struck me most was the apparently rather small number of the 'semi-aquatic' insects on the wing. No Caddis-flies, few Stone-flies, and only a fair number of May-flies (largely subimagines) were observed, although the very sunny day raised expectations of larger numbers. Examination of submerged stones from the River Ure suggested that in this part of the river Stone-fly nymphs were not very varied. *Perla carlukiana* and *Chloroperla grammatica* were the most noticeable and were quite plentiful. *Heptagenia sulphurea* and *Ecdyonurus venosus* were the most obtrusive May-fly nymphs and both were very abundant. The most interesting Caddis-fly larvæ were those of *Lepidostoma hirtum*, occurring in large numbers and showing the transition from the young cylindrical case composed of fine sand grains, to the later quadrangular one made of portions of plant tissues. Other Caddis larvæ included *Hydropsyche* (possibly *instabilis*), which were very plentiful, *Plectrocnemia*, *Rhyacophila* and *Agapetus* (many of which were just pupating). Associated with these were the larvæ of the Whirligig beetle (*Cyrinus*), tubes of the *Rheotanytarsus* type, and pupæ of *Simulium* (which Cheetham mentioned as exceptionally plentiful and troublesome in the woods).

Leeches, *Piscicola geometrica* (parasitic on fishes) and *Herpobdella* (which attack snails) were numerous, and the striking-looking snail, *Theodoxus fluviatilis* (L.) occurred. Among the shingle the bug, *Acanthia C. album* Fieb. was active.

Insects on the wing in the neighbourhood of the river included:

MAY-FLIES. *Baetis vernus* Curt. (subimagines and imagines).
B. pumilus Burm. (subimagines and imagines).
Ecdyonurus venosus F. (subimagines).
Rithrogena semicolorata Curt. (subimagines).

STONE-FLIES. *Chloroperla grammatica* Poda.
Leuctra inermis Kmpy.

In the woods the Scorpion fly, *Panorpa germanica* L. was in numbers (many in a teneral condition).

Hemiptera were not numerous, but the following were seen: *Anthocoris nemorum* L., *A. nemoralis* F., *Thamnotettix subfuscus* Fall.

BETTERFLIES did not seem to be plentiful, and only a few common species were taken, including: *Rhagonycha testacea* L., *R. lignosa* Müll., *Adrasus nitidulus* Mn., *Phyllobius argentatus* L., *P. calcaratus* F., *Adalia bipunctata* L., *Lestiva longelytrata* Goeze.

BUTTERFLIES seen included the Common Whites, Orange-Tip, and Small Copper.

Miss C. ROB writes on the flora: Magdalen Woods, though not so rich in botanical interest as Hackfall were so beautiful that no fault could be found. The Beech trees and the Blue-bells, *Scilla nutans*, were very fine and other plants seen were *Pyrola minor*, *Carex strigosa*, *Festuca sylvatica*, also several seedling colonies of seedling *Saxifraga granulata*.

Tanfield Carr and the neighbouring fields were good and among others we saw *Primula farinosa*, *Trollius europæus*, *Schœnas nigricans*, *Colchicum autumnale*.

Near the village, *Stellaria nemorum*, *Cardamine amara*, *Berberis vulgaris*, *Atropa Belladonna*, *Helleborus viridis* and *Sedum dasyphyllum* were found; *Carex digitata* was seen near Tanfield Lodge.

Bryology: Mr. W. H. BURRELL writes: The route followed did not offer much to interest students of mosses; dense carpets of herb mercury and garlic were unfavourable; few of the rarer species known to occur in the district, were seen. In addition to the very common mosses the following were reported:—*Barbula tophacea*, *Weisia verticillata*, *Trechostomum crispulum*, *Anomodon viticulosus*, *Pterygophyllum lucens*, *Neckera complanata*, *Hypnum commutatum* and *Tortula marginata*. The last named is not in the Census Catalogue for V.C. 65 and is apparently an addition to the flora of the North-west division.

YORKSHIRE CONCHOLOGISTS AT YORK

ELSIE M. MOREHOUSE

ON June 1st, members of the Yorkshire Conchological Society, the Conchological Section of the Y.N.U., also the York and District Field Naturalists' Society met under the leadership of Mr. Charles Allen. First some brickponds were visited by the Malton Road, some five miles out of York, here the true form of *Planorbis albus* Müll, also *P. spirorbis* Linn., *P. umbilicatus* Müll, *Acroloxus lacustris* Linn., *Pisidium milium* Auctt, *P. nitidum* Jenyns., were taken among other interesting 'finds.'

Next the party was conducted on a walk of about four miles across fields, through woods, etc., while here and there a most delightful pond was dredged; all the previous named species were found, in addition to which the following were added to the list:—*Limnaea pereger* Müll, *L. stagnalis* Linn., *Bithynia leachi* Sheppard, *Planorbis fontanus* Lightfoot, *Anadonta cygnaea* Linn., *Sphaerium corneum* Linn., *Pisidium Subtruncatum* Only *Helix nemoralis* Linn., *Arion ater* Linn., and *Arion ater* v. *marginella* Schranck were noted for the land species.

A point of interest about the specimens taken from one or two ponds was the extreme cleanliness of the shells, no corrosion or algæ marred their beauty; this was especially noticeable with one lot of *Limnaea pereger*.

REVIEWS AND BOOK NOTICES

The School of Biology, by C. Thesing, pp. 368, 92 figures, price 18/-. (Routledge). The aim of the author of this book is that of presenting in popular form, the present position of the more fundamental biological subjects. He aims to do this in such a way as to enable an untrained reader to think biologically. On the whole, it is probable that he would succeed. The book is written in dialogue form and it will prove extraordinarily stimulating, even to a trained biologist. The translation is excellent—the range of subjects discussed is very wide, well chosen, and treated in a thoroughly up-to-date manner. The book may be recommended with confidence.

The World of Nature, by H. C. Knapp-Fisher, pp. 512, numerous illustrations, 6/- net. (Gollancz). This book also attempts to make the world of nature intelligible to the ordinary educated person. It describes salient features of the environments surrounding plants and animals, their modes of life and certain features of selected animals and plants. It contains much of naturalistic interest and touches on a wide range of topics. The author has, however, attempted perhaps too much and has included much that is vague or inaccurate in his treatment.

Fishes, their ways of Life, by Louis Roule, pp. 312, 52 text figs., 12/6. (Routledge). This noteworthy book is written by an expert, but it can be read with interest and profit by any naturalist or biologist. Its language is plain and lucid. It discusses a variety of unusual topics connected with fish in an original, exact and very interesting manner. While the author employs no technical terms he deals with subjects like fishes respiration, their vision and hearing, how they swim and their environment, in a fundamental manner. It is clearly based on a wealth of first-hand information and may be strongly recommended.

Gone Rambling, by Cecil Roberts, pp. 336, four coloured plates, 7/6. (Hodder and Stoughton). This book is a continuation of its author's light and interesting descriptions of country life. Nothing comes amiss to its author. The sunken floors of old cottages, maps, cottage cookery and the whole atmosphere of the Chilterns are discoursed on, with interludes in the by-ways of history. While it deals with naturalistic subjects only incidentally, it will be a welcome volume for those who delight in the English countryside.

CORRESPONDENCE

To the Editors of *The Naturalist*.

SIRS,

Mr. A. Smith's Presidential Address to the Lincolnshire Naturalists' Union has just been issued in that Society's *Transactions*, recently to hand, which are edited by F. T. Baker, F.R.E.S., and A. Roebuck, N.D.A., F.R.E.S.

Mr. Smith makes two statements which should be put right. He first states "Until 1902 Mr. Wm. Denison Roebuck was editor of *The Naturalist*, and during all those years he found room in the pages of that magazine, not only for some of the Presidents' Addresses, but also for full reports of the Field Meetings: these reports being much more detailed and more lengthy than those which in more recent years we have been able to print," and, later, "Since 1902 Wm. Denison Roebuck had ceased to be editor of *The Naturalist*, and thereafter that magazine could not, as before, afford adequate space for our reports."

We think this is unfair, as we always gave particular attention to our neighbouring county, and its reports, and possibly one of us, being a native of that county, was rather prejudiced in favour of notes thereon. Without going into the question of the attention Lincolnshire has received during subsequent years, we may, at any rate, refer to three of them. During 1903, the first year we took over, there are no fewer than 109 different items relating to Lincolnshire recorded in the index, and these include a number of illustrations. The papers have the following names attached to them: George, Kew, the two Peacocks, Stowe, Burton, Walter, Carter, Thornley, Fowler, Preston, Stather, West, etc. In the 1904 volume there were 55 notes and papers, including four pages by Mr. Carter, three pages by Mr. Preston, three pages by Dr. George, and other notes by Parkin, Overbeck and Porritt. In addition there are reports of the L.N.U. and Peterborough Society's work.

In 1905 there were 56 items, including ten pages by Dr. George, who also had shorter notes, five pages by Peacock, seven pages by Stather, and five pages of small type dealing with Lincolnshire mammals by Mr. A. Smith himself, who also had two pages on Hepatics, ten pages by Kendall in a paper which includes Lincolnshire, and three reports of the L.N.U. meetings. Surely this is a fair share for the county and one regrets that Mr. Smith should have forgotten this.

Yours, etc.

T. SHEPPARD.

T. W. WOODHEAD.

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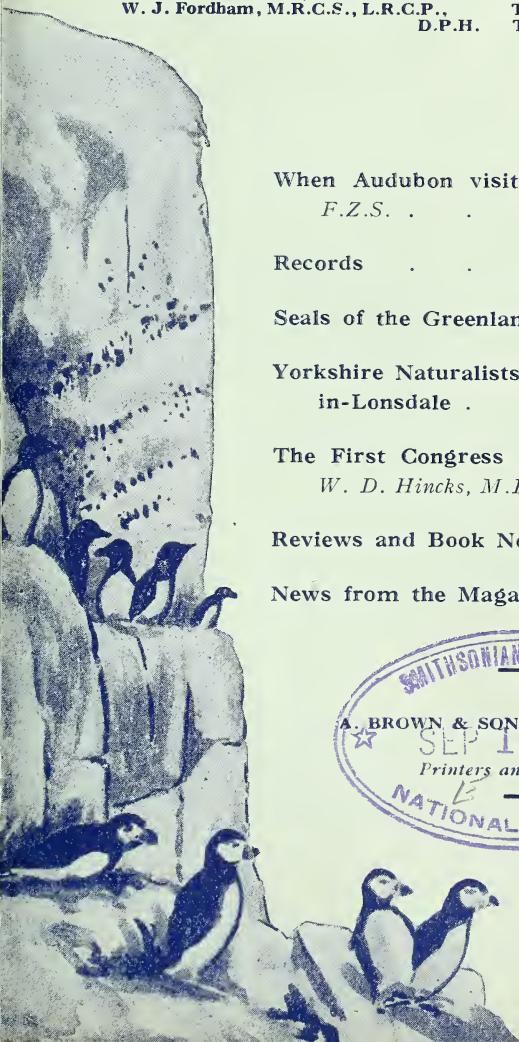
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WHEN AUDUBON VISITED LIVERPOOL The Great American Naturalist in England

ERIC HARDY, F.Z.S.

It is more than a hundred years since John James Audubon, the greatest of American naturalists, visited Liverpool to raise funds in England for the publication of historic books on *The Birds of America*, yet despite the time, the lapse of years seem scarcely to have altered the memories of his visit, and the city of Liverpool to-day bears many reminders of the presence of this great American bird-watcher in our midst. The rooms where the Liverpool Naturalists' Field Club meet at the Liverpool Royal Institution, in Colquitt Street, are still adorned with the original oil paintings of American birds made by Audubon, including a life-size portrait of a wild turkey, and red-tailed and other hawks in flight. When Audubon held his first exhibition of bird paintings in England, he made it at the Liverpool Royal Institution, and raised £100 towards his *Birds of America*. In appreciation of the help of the Liverpool naturalists, he presented these few bird pictures to the Institution. I am writing these notes within the shadow of Greenbank Park, Liverpool, where lived Audubon's friend, the late William Rathbone, of the great Liverpool Liberal family, and where Audubon sat, and watched, and wrote about English birds. I have just walked across that park and watched all the birds he watched there. The present owner of the house of Greenbank, Mr. Hugh Rathbone, a former Lord Mayor of the city and great-grandson of Audubon's great friend, tells me he still cherishes some personal letters Audubon wrote to his great-grandfather during his visits to Liverpool, and also water-colour paintings of an English Redbreast (different from the common American 'robin') and a Blue-tit, painted by Audubon from life in Greenbank Park. And in the public library at Liverpool are preserved more of the letters written by Audubon to his local friends, during his various visits to the city. It was Liverpool and Liverpool naturalists who helped Audubon raise the funds for his *Birds of America* more so than any other part of Great Britain.

Audubon first landed at Liverpool on July 20th, 1826, from the *Delos*, and took lodgings at the Commercial Hotel, Duke Street. The street remains; the hotel has long vanished, but the lodgings Audubon used in Liverpool were a short distance from our Naturalists' Club on the one hand, and a stone's throw from the Liverpool Cathedral Wild Birds' Sanctuary, the only one of its kind in the world, on the other. It was a beautiful section of tree-line city when Audubon stayed, a very high-class residential quarter. Now it is

slumland. It is impossible to give all the details preserved of Audubon's days in Liverpool, but he made many social acquaintances, including Lord Stanley, who owned a great private zoo at Knowsley Park, and later to become the thirteenth Earl of Derby, was a founder and first president of the London Zoological Society; William Roscoe, the Liverpool botanist and anti-slavery leader, who founded the Liverpool Botanic Gardens; and Dr. Traill, the great Scottish geologist. On August 5th, he met the naturalist Lord Stanley, who inspected Audubon's bird drawings. 'He said, "Sir, I am glad to see you,"' records Audubon's diary. 'He pointed out one defect in my drawings for which I thanked him, but he admired them greatly. He spent five hours in examining my collection, and said, "This work is unique, and deserve the patronage of the Crown."' On August 9th he opened his exhibition of bird paintings at the Royal Institution, charging one shilling entrance fee, and averaging three or four pounds per day, which was good money in such times. Here he painted the life-sized turkey, in 23 hours, working in his shirt-sleeves, for his friends. This painting is often reproduced in editions of Audubon's *Diary in America* (as Herrick's), but the inscription under our original canvas must be mistaken, I am sure. It reads: 'American wild turkey, painted by J. J. Audubon (in 23 hours) and presented in 1840.' The date should be 1826.

The Liverpool customs charged Audubon twopence each duty on his drawings and fourpence per pound on his books. But he enjoyed his stay in our city, and evidence of his liking for the friends he made is borne in the names he gives some of the birds in his *Ornithological Biography*, as the Rathbone Warbler (after William Rathbone, of Greenbank Park), the Stanley Hawk (after Lord Stanley, son of the Earl of Derby), and Roscoe's Yellowthroat (after William Roscoe, the Liverpool reformer), though these names are seldom used nowadays by American naturalists. Of his stay at Greenbank Park, Liverpool, which I know so well, Audubon writes that he shot and painted a Redbreast there, but he regretted the avenue of trees leading up to the house contained no vulture or eagle! I have watched red squirrels, sparrow-hawks and kestrels there, but Audubon does not seem to have noticed them. He also painted the spotted flycatcher here, and it is interesting that this bird no longer nests in the park, so that Audubon's record is our authority for its presence. In fact, we look to Audubon's writings for many valuable records still important in our local ornithology, for Liverpool had few good ornithologists at the time of his visit. In the October he wrote of Greenbank, Liverpool: 'I turned towards the Mersey (river) reflecting the calm, serene skies,

and listened to the voice of the Quail, here so shy. I walked to the tide-beaten beach and watched the Solan-Goose.' The Solan-Goose or Gannet is no longer seen fishing in the Mersey, though it occasionally visits Liverpool Bay, and the part Audubon watched it would be off the Aigburth shore, five miles or more up river. There are no Quails near Liverpool now, nor have we any other record of these birds here than Audubon's, for these tiny migratory game birds, once so abundant in Britain, are now almost extinct.

At Knowsley Park, Lord Derby's estate near Liverpool, he remarked upon the abundance of Partridge and hares, as anyone might remark to-day, and when he visited the Quarry Bank, Liverpool, he saw the Chaffinch and the Wood-Pigeon. On May 14th, 1827, he made an interesting record when he watched a Wagtail a few paces from St. Paul's Church in the city. The bird was probably a Pied-Wagtail, which I have often seen flying over the city, and sometimes landing in it, but St. Paul's Church is now demolished. At Greenbank he used to lie on the grass listening to the harsh chatter of the English Magpie, the sweet, mellow song of the Blackbird, and the bolder notes of the Song Thrush. He said the park was an ideal birds' sanctuary, full of song, and when at the house he saw the tame Redbreast that hopped in through the window and about the carpets of his room. He also records the Redwing Thrush, one of the winter thrushes we get from Norway, in Greenbank Park, an interesting study. I have seen these Redwings in the adjoining Sefton Park in winter, but not yet in Greenbank. Audubon also noted here the Skylark, Rook, Stock-Dove, and Wood-Pigeon, but these are no longer birds of Greenbank. In all his notes he refers to our Redbreast or robin as the 'red-breasted warbler,' which is quite understandable, for the Redbreast is one of the warbler tribe. The great interest of Audubon's notes on Liverpool is his depth of knowledge of British bird-life, which is so surprising for a stranger, who has studied such an entirely different representation of bird-life as obtained in North America, and is on his first visit to the Old World. We have a locality here called 'Otterspool,' and for long it was a controversy if the name had anything to do with the animal, the otter, and some declared no otters ever frequented there. But I was lucky to find that Audubon, during his stay, found and painted an otter in a trap near Greenbank, so that dispute was settled by our good American!

After his first visit to Liverpool, Audubon went on to Manchester, on September 10th, to stage another exhibition of his bird pictures; but that did not pay, and on the 28th he was back in Liverpool to consult the prospectuses of his book with John Bohn, the London bookseller. On this date

he made a reproduction of his painting of the Wild Turkey of America, now but the size of his thumb-nail, for Mrs. Rathbone, who had it engraved upon a precious stone and used it for her seal, which, later, she presented to Audubon. On October 6th he went back to Manchester, and on to Edinburgh, meeting the author Sir Walter Scott, and others, including Professor Jameson, who introduced his work to the public through the pages of the *Natural History Magazine*. It was not until the next spring that he exhibited the five plates of his first number of *The Birds of America*, at the Royal Society, the Liverpool naturalists having objected to the size of his work costing £100 per copy, which they declared would make it unpopular. He was elected a member of the Royal Society. In the March he left Edinburgh and travelled to London *via* Manchester, and in the September left London for Paris where, at the Jardin des Plants, he met the great Cuvier. He was back at London in the November, and only delayed his return to Liverpool that year because he had no complete copy of his work to bring with him. May 5th, 1828, he reached New York.

In 1830 Audubon once more arrived at Liverpool after 25 days passage from New York, on the packet-ship *Pacific*. He found, through Lord Stanley's influence, he had been elected a Fellow of the Royal Society of London, the greatest honour Britain can afford a scientist. Unfortunately he found his subscribers were not all eager to pay up, and once more he resorted to pencil and brush, painting out, and his, birds and mammals, to raise the necessary funds for his *Birds of America*. He did not stay long in the city, and was touring the country and especially in Edinburgh, where Mr. Black the publisher issued his first part of the *Ornithological Biography of the Birds of North America*, a work of nearly three thousand pages, only to find when starting writing his work that no less than three editions of his rival, Wilson's *Ornithology*, were to be published in England. On April 15th, 1830, he left Edinburgh for Liverpool, his great work written ; then he went on to London, and Paris, and returned to New York in the September of 1831.

April 16th, 1834, saw him again sailing from New York for Liverpool, in the steam-packet *North America*, this time with his wife and son John. In 1836 Audubon and his son John returned to New York from Portsmouth on the *Gladiator*, taking with them 260 live birds received as a present from their Liverpool friend Lord Stanley, now the Earl of Derby. In 1837 Audubon made his third and last visit to Liverpool from New York to prepare the fourth and fifth volumes of his *Ornithological Dictionary* for the press, which were published in the fall of 1838 and 1839 ; and the following year

he bid adieu to Liverpool and returned to America. During one of his earlier visits, the great American naturalist strolled along the Bollin Valley, near Manchester, in the district where his mother or wife was born, bird watching, and 'took an immense walk up and down the river, and about the woods,' and shot a pheasant out of season in Lord Tatton's coverts! The same woods he walked in now form a nature sanctuary in memory of the late T. A. Coward, of Cheshire, one of the most respected of modern students of British ornithology.

The impression upon British ornithology made by these three visits of Audubon can never be eradicated, and for his visits to Liverpool and his notes made during his stay with his friends here, especially the Rathbones at Greenbank, there would be a serious gap in our records of local bird-life until some twenty years after his departure, when Dr. Izaak Byerley issued his *Fauna of Liverpool*. It is regrettable the compiler of this 1850 work made no reference to the visits of Audubon to our city, with which Byerley surely must have been familiar as a young man. It was not until 1860 that the Liverpool Naturalists' Field Club was founded, by the Rev. H. H. Higgins, the English clergyman-naturalist, who discovered and examined the Codex Sinaiticus at St. Catherine's Convent, ten years before the German collector Tischendorf, and Dr. Dickinson, author of *The Flora of Liverpool*. At the time of Audubon's visit the local naturalists were grouped in the Liverpool Literary and Philosophical Society, and many of them made Audubon's acquaintance. I think there ought to be some more lasting tribute to Audubon's visit to Liverpool than the oil paintings and letters of his we preserve!

Bibliography: *Audubon the Naturalist*, by Francis Hobart Herrick; *Life of Audubon*, by Robt. Buchanan, supplemented by correspondence with living ancestors of local people Audubon visited and stayed with.

RECORDS

SOME NEW YORKSHIRE DIPTERA

AMONG some Diptera recently kindly determined for me by Mr. J. E. Collin are three species new to Yorkshire.

Actia bicolor Mg., Frog Hall, Allerthorpe, 29/5/31. This is a rare but widely distributed species which occurs from Cornwall to Rannoch and Invershin and has been bred from *Lasiocampa quercus*, *Scardia boleti*, and *Tephroclystia denotata*.

Rhamphomyia plumipes Mg., a female, Fylinghall, 6/28. A very rare species only known to Mr. Collin by a female from Foxhall, Suffolk. (C. Morley.)

Sciomyza pallidicarpa Rnd., Fylinghall, 6/31. A widely distributed species occurring in Cornwall, Hereford, Oxford, Westmorland, and Forfarshire.

New to East Yorkshire are *Myopa buccata* L. (Barmby Moor, 31/5/33, a small female, a widely distributed species). *Sapromyza lupulina* F. (Allerthorpe, 24/9/34, also widely distributed). *Delia intersecta* Mg. (Frog Hall, 4/31, not recorded north of Durham. Found near Amiens in the nests of the processionary caterpillar), and *Opsolasia roederi* Kow. (Frog Hall, 4/31, a widely distributed species, bred in France from the nests of sparrow and chaffinch).

New to V.C.65 (North West Yorks.) is *Melinia pullula* Ztt. (Cronkley, 1/6/25. Not recorded north of Co. Durham. Larvæ attacking Iris in France).

Also worthy of record though not new is *Delia trichodactyla* Rnd., Frog Hall, 11/7/31, common about aculeate burrows. It has been recorded as the prey of *Oxybelus uniglumis* and probably has some association with fossors.—W. J. FORDHAM, M.R.C.S., L.R.C.P., D.P.H.

YORKSHIRE DIPTERA

WE were fortunate in having Dr. F. W. Edwards for a short visit to the Cautley District towards the end of June and he sends the following notes. At Cautley *Diamesa montium* Edw. was taken in pairs on the tent roof, the ♀ being new to the B.M. collection. *Serromyia femorata* F. was numerous on the same place and had as prey *Spaniotoma rubicunda* (Mg.). The same prey was also taken by *Trichina clavipes* Mg.

At Cautley Spout he got *Dicranomyia didyma* Mg., *Ephelia mundata* Lw., and *Ornithomyia legopodis* Sharpe. In Uldale he got *Boletina reuteri* Lundst., *Scatopse coxendix* Verr., and in Helmside Ghyll *Sycorax silacea* Hal. and *Lonchoptera tristis* Mg. On the summit of the Calf at Cautley we saw *Tipula excisa* Schum. in hundreds, mostly males, but a few females were present. Whilst writing of *Tipula* it is interesting to note the first I saw of this genus this year was a single *Tipula macrocera* Ztt. on April 13th near Crummack; this species was an addition to the Yorkshire list last year, being caught on Inglebro' in June; this year the single specimen is all I have seen though I have visited the Inglebro' locality once or twice. I made several visits to the place near Crummack in the following weeks but only found *Tipula montium* Egg. These visits added one new species to our list in *Bibio reticulatus* Lw. which occurred on the grass singly but spread over a fairly large area.

The genus *Orimarga* is found in the colder countries or on mountains. I found *O. virgo* Zett. in Uldale, August 1st, 1927, then I got *O. alpina* Zett. (*attenuata* Wlk.) at Norber, June 26th, 1931. Now this year I have had *O. alpina* Zett. at Thieves Moss, Crummack, July 8th, whilst at Burton-in-Lonsdale, July 10th, and Norber Syke, July 8th, I caught *O. virgo* Zett.—CHRIS. A. CHEETHAM.

SEALS OF THE GREENLAND SEA

R. W. GRAY

SEALS spend much of their time in the water, feeding, playing about or moving from place to place much like small cetaceans.

Seals, again like cetaceans, have their breathing movements designed to diminish the risk of water entering their lungs. Scoresby says : ' Seals (*i.e.* Greenland or saddle-seals) are often seen on their passage from one station to another in very large shoals. In such cases for the sake of respiration, they all appear, every now and then, at the surface together, springing up so as to raise their heads and necks, and often their whole bodies out of the water. Their progress is pretty rapid ; their actions appear frisky ; and their general conduct is productive of much amusement to the spectator.'¹

The seals of the Greenland Sea seem to feed largely on small fry : pelagic crustaceans, small cuttle-fish or squid and small fish. It is interesting to note that the narwhal and bottle-nose appear to do the same. In 1888, I found crustaceans only 2½ ins. in length in the stomach of a narwhal,² and as my father states, the bottle-nose—a whale reaching a length of 30 feet—feeds on quite small squid.³

I. THE SADDLE OR HARP SEAL (*Phoca groenlandica*.)

In my paper ' The Breeding Places of the Saddle or Harp Seal,'⁴ I have already referred to this seal at some length.

It is a pelagic seal and a seal of the broken or ' pack ' ice. In other words, it is seldom seen far from the open sea. It has a predilection for ' points,' and for the detached bodies of ice known as ' streams.'

In the Greenland Sea it finds conditions more or less to its liking—following the ice-edge—all the way from Cape Farewell, or the latitude of Iceland to Northern Spitsbergen.

It usually produces its single young or ' whitecoat ' in lat. 73° north-east of Jan Mayen, where in spring the ice usually forms a great easterly projecting point, exposed to the swell of the ocean on three sides, termed by the British sealers and whalers of a generation or two ago ' The Point ' or ' End of the Sealing Ice.'

In choosing a breeding place, my father says : ' The adult seals are influenced by two things : firstly, that the ice lies on water in which their food (consisting principally of a small

¹ Scoresby, W., *Arctic Regions*, Vol. 1, p. 509.

² Gray, R., ' Voyage of *Eclipse*,' *Zoologist*, 1889, p. 102.

³ Gray, D., ' Notes on the Habits of the Bottle-nose Whale,' *Proceedings, Zoological Society*, London, December, 1882.

⁴ *Naturalist*, June, 1932, p. 183.

kind of shrimp) abounds; secondly, that the ice is some distance inwards from the outside edge, and at the same time is within the influence of the swell. It is necessary for the adult seals to be able to enter the water to feed, and as my father says the swell (if not excessive) acts beneficially by keeping the ice in motion and preventing the pieces from congealing into extensive sheets or 'floes.' My father also says the seals prefer rough or 'hummocky' ice, as it breaks the wind and affords shelter to the young seals.¹

In May the adult seals, particularly the males, again go on the ice—this time the heavy ice in about lat. 76°. If undisturbed, and the weather continues fine, they will sometimes lie on the ice for weeks at a time without entering the water to feed. Their capture which was accomplished by means of boats was termed the 'Old Sealing.'²

Concerning this 'fishing' my father says: 'They (saddle-backs) are now fair game. It requires labour and skill to approach them, some of them being always on the watch. The best way to get at them is to approach them from the lee side, and if the sun is shining to keep in its rays. Once within 70 yards or so, if the seals are lying well and the man (in charge of the boat and the only one with a rifle) is a good shot he ought to be able to kill as many as will load his boat (with skins and blubber) without changing his position.'

My father also says when the saddle-backs intend shifting (*i.e.* leaving the ice) they make a great noise, all giving tongue together in a kind of 'wurr'; they also do the same thing before bad weather.

Like the whale-bone whales and the so-called crab-eating seal of the Antarctic,³ this seal, as my father says, seems to feed largely on pelagic crustaceans.

(1) Scoresby says: 'As in some respects, they (*i.e.* the saddle-backs) eat up the food required by the (Greenland) whale; (Greenland) whales are seldom to be found where they are numerous.'

As to the food of the Greenland whale, Scoresby says: 'The food of the (Greenland) whale consists of various species of actinæ, clones, sepia, medusæ, cancri, and helices, or at least some of these genera are always to be seen (in the water) wherever any tribe of (Greenland) whales is found stationary and feeding. In the dead animals however, in the very few

¹ 'The Greenland Seal Fisheries,' Buckland's *Logbook of a Fisherman and Zoologist*, p. 254.

² At this time the adult seals are probably moulting.

³ The crab-eating seal of the Antarctic, according to the late Dr. E. A. Wilson, feeds on crustaceans (*Euphausia*) which it catches by means of the sieve-like action of its cheek teeth (Vol. II, 1907), of the results of the National Antarctic Expedition (Published by the Brit. Mus. Nat. Hist.), p. 36.

instances in which I have been enabled to open their stomachs, squillæ or shrimps were the only substances discovered. In the mouth of a (Greenland) whale just killed, I once found a quantity of the same kind of insect.'

Scoresby also says: 'Another small species of this family (Gammarus) was found in large quantities in the stomach of some mysticete (*i.e.* Greenland whales). It is remarkable for the largeness of its eyes.'

(2) A log book in my possession contains the following entry:

1873, Aug. 5th; lat. 74° 30' N. long. 10° 30' W.,
'shrimps seen (in water) and many (saddle) seals feeding.'

(3) Dr. R. Brown who made a voyage to the Greenland Sea on a sealing and whaling vessel in the fifties or sixties says: 'During the (young) sealing season in the Spitsbergen (*i.e.* Greenland) Sea, I have invariably taken out of their stomachs various species of *Gammarus* (*G. sabini*, etc.), collectively known to the whalers under the name of "mountebank shrimps," deriving their name from their peculiar agility in the water.'¹

(4) The stomachs of saddle-seals opened by me in 1888, contained *Euthimisto libellula* and *Nyctiphanes norvegica*.

2. THE BLADDER-NOSE OR HOODED SEAL (*Cystophora cristata*).

The bladder-nose is another pelagic seal, and another seal of the broken or pack ice. Like its congener the saddle-back, it produces its single young or 'blue-back' in March, on the sealing ice within the influence of the swell.

Speaking of this seal, my father says: 'The next in importance to the saddle-back is the "bladder-nose" or "hooded seal," so called from having a loose bag (of skin) hanging (down) over its nose, which it has the power of blowing up, and always does when enraged.'

This seal is twice the size of the saddle-back, is black in colour, and spotted somewhat like a leopard.

'Before the rifle came into use, the old (*i.e.* adult bladder-nose) was held in deep respect by the sealers. Many a time a boat's crew have had to beat a retreat off the ice into the boat after having had their seal-clubs snatched out of their hands by this powerful animal. One peculiarity about them is that the females are not more than half the size of the males. They are more irregular in giving birth to their young than the saddle-back; and, strange to say, the young ones cast their fur in their mother's womb, and it is found lying (on the ice) beside the recently-born young in round

¹ Brown, R., *Proc. Zool. Soc.*, London, 1868, p. 411.

balls. They (the "blue-backs") are always most numerous near the (breeding) saddle-backs, but are seldom found among them.'

Like its big relative, the elephant seal of the far south, the bladder-nose seems to feed largely on cuttle-fish or squid.¹

Referring to this seal, Dr. Nansen says 'Its stomach is often quite full of cuttle-fish, of which great quantities may be found in those (Icelandic) parts of the (Greenland) Sea.'²

The bladder-nose, however, does confine itself to cuttle-fish. The stomach of one examined by Dr. Nansen was full of rose-fish (*Sebastes notvegica*). He says: 'We pulled out three whole rose-fish which were quite fresh and red . . . they were from a foot to a foot and a half in length; and the stomach contained the remains of at least twice as many.'

The stomach of a bladder-nose opened by the writer in 1888, contained 'a few fishes eyes and crustacean remains'; another contained 'a few small otoliths of fish and beaks of cuttle-fish'; others contained only mud.

3. THE BEARDED OR GROUND SEAL (*Erignatus barbatus*).

This is a seal that was seldom seen by the whaling vessels. So far as I have observed it is a solitary seal, and like the walrus, a seal that is seldom seen very far from the land. It is certainly not a seal of the outer or broken ice like the two last.

Speaking of this seal my father says: 'The next is the "ground" or "bearded seal," so named from its being always (seen) near the land, and from its magnificent white beard. Its colour (? when out of the water) is a dull brown. (So far as the Greenland Sea is concerned) it is the largest of the seal tribe. Its food consists mostly of prawns.'

As my father says, this large seal seems to feed largely on crustaceans.

(1) Malmgren who accompanied Nordenskiöld on his arctic expeditions, records that in the stomachs of all he examined he found large species of *Crangon* and *Hippolyte* (*C. boreas*, *Sabinea septemcarinata*, *Hippolyte polaris*, *H. sowerbyi*, and *H. borealis*, and *Anonyx ampulla* in abundance;³ occasionally small fishes (*Cottus tricuspis*, Reinh.), and many hundreds of the opercula of species of *Buccinum* and *Natica clausa*, as well as shells of a large *Lamellaria*.

¹ According to Matthew's *Discovery* report on the 'Natural History of the Elephant Seal,' thirty-five per cent. of the stomachs of elephant seals examined by him contained only cuttle-fish beaks, some of large size; no trace of any other food was found.

² Nansen, *Hunting and Adventure in the Arctic*, p. 267.

³ *Arch. fur Naturg.*, 1864, p. 77 (cited by Allen in his 'North American Pinnipeds,' p. 674).

(2) Ludvig Kumlein, naturalist to the Howgate Polar Expedition, says: 'They dive to great depths after their food, which is almost entirely *Crustacea* and mollusks, including clams of considerable size. . . .¹ In fact, during their moulting time their stomachs contained nothing but stones, some of them nearly of a quarter pound weight. They seem to eat nothing during the entire time of shedding—probably six weeks.'

(3) F. Spencer Chapman in his recent volume *Watkin's Last Expedition*, says:

- (a) 'It was a young bearded seal, seven feet long and five and a half round the middle . . . the gut of the seal was absolutely full of worms. There were prawns and small flat eels in its stomach.' (p. 223).
- (b) 'This seal (a bearded seal) was nearly nine feet long, and enormously fat. The stomach contained several kinds of cray-fish and prawns.' (p. 280).

4. THE FLOE-SEAL OR FLOE-RAT (*Phoca hispida*.)

As its names imply this seal is a seal of the unbroken or 'floe' ice. In other words, unlike the saddle-back and the bladder-nose, it does not usually occur among the broken or pack ice.

It is neither exclusively pelagic or exclusively littoral being found not only near the land but at a great distance from it. The floe-seal's requirements are unbroken ice of a certain kind, lying on water or drifting over water rich in the creatures on which it feeds.

In the Greenland Sea, at any rate in the spring and summer, its distribution agrees pretty well with that of the Greenland whale and narwhal. When the whalers were looking for Greenland whales they were always pleased to see the floe-seal. It is frequently mentioned in my father's log books. Here are a few examples:

1885, June 28th: lat. 74° N., long. 14° W.; 'many bears prowling about; floe-seals innumerable (on the ice and in the water); also some narwhals.'

1888, June 5th: lat. 78° 30' N., long. 0° 30' E.; 'among floes; some narwhals and many floe-seals to be seen.'

1888, June 8th: lat. 77° 38' N., long. 0° 7' E.; among floes; numbers of floe-seals, narwhals, and birds: everything in fact that used to indicate the immediate presence of (Greenland) whales.'

1888, July 24th: lat. 74° 42' N., long. 13° 30' W.; ship

¹ Bull. U.S. Nat. Mus., No. 15, pp. 61-63 (cited by Allen in his 'North American Pinnipeds,' p. 671.

made fast to a floe ; many bears and floe-seals ; got a narwhal.'

Referring to this seal, my father says : ' The fourth and smallest kind (of the seals of the Greenland Sea), is the " floe-seal " or " floe-rat," as the sailors call them. They get their name (of floe-rat) from the habit (they have) of always lying on the " field " (or floe) ice, and having holes ready to pop into when alarmed. Their great enemy is the polar bear ; they are his principal food. The floe-seal is a pretty little animal ; its hair is short, with grey irregular stripes down the back. The young one is not much larger than a soda-water bottle.'

This is an interesting little seal. Like the larger weddel seal of the Antarctic it contrives to pass the winter in a high latitude under the ice and out of sight. In this situation it can get food and is safe to some extent from its enemies, the polar bears and the Eskimos. At the same time it escapes the severe cold.

As Steffanson points out in his book *The Friendly Arctic*, it confines itself to ' bay ' or moderately thick ice, and is never found under very thick ice the product of more than a single winter's frost (p. 172 and p. 183).

Its methods are ingenious ; when autumn comes round it takes up its position in a ' lane ' or open space, and selecting a few places some distance apart (for it does not trust to one) it attacks the ' bay ' or new ice as it ' makes ' from underneath, and no matter how severe the frost and how thick the resulting ice, it does not permit its *atlucks* or breathing holes to freeze.

It is, however, for a number of months a prisoner under its sheet or ' floe ' or ' bay ' ice with its *atlucks* or breathing holes, and until it breaks or melts it does not quit its vicinity.

In the spring it is sometimes seen in the northern part of the Greenland Sea accompanying the ice in its southward drift, doubtless after having passed the winter in a still higher latitude. My father's 1887 log book, contains the following entry :

May 28th : lat. 80° N., long. 3° E., ' numerous floe-seals on the ice.'

As the ice drifts south, and as the season advances, and the snow on its surface melts, the floe-seal appears on the top of the ice, forming a familiar sight and an interesting creature to watch through a telescope from a whaling ship's mast-head.

Sooner or later the ' floe ' or sheet of ice in which the floe-seal has its *atlucks* melts or breaks or is carried too far south, and the floe-seal it may be supposed obliged to return to a high latitude and await the onset of the frost.

Not only does the floe-seal pass the winter under the ice but when the spring comes round it produces its single young in the same furtive situation.

According to Kumlein the cavity in which it does so is from 6 to 10 feet in length, and from 3 to 5 feet in width, the height varying with the thickness of the snow covering; the *atluk* is at one extremity of this excavation, and in such a position that it is always a ready channel of retreat in case of danger.

This is another seal that seems to feed largely on crustaceans. Here is the evidence.

- (a) Sir J. Ross says: 'It (the rough seal) feeds chiefly on *Mysis* and other small cancri.'¹
- (b) Malmgren states explicitly that this (*i.e.* mollusks and crustaceans) is the food of the rough (*i.e.* the floe-seal) and bearded seals, as he has found by an examination of their stomachs.
- (c) Kumlein, who spent a winter in Cumberland Gulf, says: 'After they (the young) begin to shift for themselves their food, for a time at least, consists of *Gammar*i of different species.'
Kumlein also says: 'The food of the adults consists largely of different species of crustaceans, and during the winter, especially, they subsist to a considerable extent on fish. I have found in them remains of *Cottus scorpius*, *C. groenlandicus*, *Gadus agae* (commonly), and *Liparis vulgaris*.'
- (d) Chapman, already referred to who spent a winter on the south-east coast of Greenland says: 'shot a seal (? a floe-seal) . . . stomach crammed full of white and rust-coloured shrimps'; again he says: 'We got two seals (? floe-seals) . . . one of the seals had in its stomach, as well as the usual shrimps, a number of polar cod, a fish resembling the ordinary cod but darker coloured, and rarely exceeding two pounds in weight.'
- (e) Stomachs of floe-seals examined by myself in 1888, contained the following:
 - (1) *Euthimisto libellula*, *Nyctiphanes norvegica* and a few cuttle-fish remains.
 - (2) *E. libellula* and *Gammarus locusta*.
 - (3) Entirely filled with *E. libellula*, mostly of large size, some measuring 40 mm. in length.
 - (4) *Euthimisto* and a few immature examples of *N. norvegica*.
 - (5) Full of *N. norvegica* half-grown.

¹ Ross, Sir J., 'Second Voyage,' Appendix, p. 20.

YORKSHIRE NATURALISTS AT BENTHAM AND BURTON-IN-LONSDALE

IN visiting this area (June 8th—10th, 1935) the Union got on to new ground. Mr. John Holmes reported that the geologists had not been able to find fossiliferous shales in the area we visited, though these are seen at Keaden and in the Hindburn, nor had they seen the calcareous bed with *Productus* and *Spirifer* mentioned by Tiddiman. They had, however, seen extensive deposits of tufa in every place examined, and this showed that the grits and shales had much calcareous material associated with them, far more than is the normal case, and accounting for the continual presence of mosses only known in limy areas such as *Hypnum commutatum* Hedw. and *Weisia verticillata* Brid.

Vertebrate Section : Mr. ASQUITH WOOD writes :

MAMMALS.—There was evidence of the rabbit and the mole being very common. I made enquiries as to bats, but rather to my surprise I failed to hear of anyone seeing any during the week-end. Possibly some members may yet come forward with information as to their presence.

FISH.—Trout were plentiful in the River Greeta.

BIRDS.—Song-thrush, missel-thrush, blackbird, water-ouzel, robin, hedge-sparrow, willow-wren, goldcrest, wren, pied-wagtail, swallow, heron, sandpiper, lapwing, ring-dove, swift, rook, magpie, starling, yellow-bunting, chaffinch, greenfinch, house-sparrow, great-tit.

Mr. H. B. Booth saw the kingfisher during the week-end.

BIRDS' NESTS.—Mr. H. B. Booth saw the nest of the water-ouzel near the water wheel. Mr. Mattinson showed me a nest of the goldcrest ; the young had now flown. I noticed a chaffinch's nest with four young ones, and nests of the song-thrush and ring-dove where the birds were sitting. These latter were in rather inaccessible positions, and were not examined.

I was surprised in a district of this nature not to see during the day any of the following birds, as the conditions seem ideal, but perhaps other members may have seen them : grey-wagtail, spotted-flycatcher, common whitethroat. The house-martin, which I find this year very rare in the county, also appeared to be absent.

Conchology : Mrs. E. M. MOREHOUSE writes : The geological features of Bentham are not conducive to a large molluscan fauna, but it was noticeable where the limestone conditions prevailed that here the majority of the species were taken. On two occasions on patches of ground in the woods not more than ten yards square, seventeen molluscs including slugs were found on one piece, while the other yielded a total of fifteen. Some of the common varieties of slugs were fairly evenly distributed on the damp parts. On Saturday the banks of the River Wenning to the east were explored, on Sunday the River Wenning to Lower Bentham, and on Monday I confined my attentions to an interesting wood on the banks of the River Greeta at Burton-in-Lonsdale. Mr. Charles Allen is including the freshwater molluscs in his report of the Freshwater Biology for the Bentham area.

The following species were taken at all the places worked, but where the name is given, in that locality only :

Vitrea nitidula Drap.

V. alliaria Miller.

V. pura Alder.

Vitrina pellucida Müll. Lower Bentham.

Euconulus fulvus Müll. Lower Bentham and Burton-in-Lonsdale.

Hygromia hispida Linn. Lower Bentham.
H. rufescens Penn. High Bentham and Burton-in-Lonsdale.
H. fusca Montagu. Burton-in-Lonsdale.
Carychium minimum Müll. Lower Bentham and Burton-in-Lonsdale.
Pyramidula rotundata Müll.
Cochlicopa lubrica Müll. Burton-in-Lonsdale.
Sphyradium edentulum Drap. Burton-in-Lonsdale.
Helix aspersa Müll. High Bentham (garden).
Arianta arbustorum Linn. Burton-in-Lonsdale.
Arion ater Linn.
A. ater var. *plumbea* Roebuck. Lower Bentham.
A. ater var. *marginella* Schranck. Burton-in-Lonsdale.
A. subfuscus var. *succinea* Bouillet. Lower Bentham.
A. subfuscus var. *succinea* s.v. *aurantica*. Lower Bentham.
A. circumscriptus var. *leucophæa* Normand. Burton-in-Lonsdale.
A. circumscriptus var. *leucophæa* s.v. *ambigua*. Burton-in-Lonsdale.
Agriolimax agrestis Linn.
A. agrestis var. *reticulata* Müll.
A. agrestis var. *pallida* Schranck. Lower Bentham.
A. agrestis var. *cineracea* Moq. Tan. Lower Bentham.
A. agrestis var. *cineracea* s.v. *grisea*. Lower Bentham.

Flowering Plants and Ferns (Dr. W. A. SLEDGE): Botanists visiting the Craven district usually devote their attention to the limestone area, and the scanty records for the Bentham and Burton-in-Lonsdale districts suggest that this part has not received the careful scrutiny which has been given to the country to the north and north-east. For this reason, therefore, the investigation of the wooded banks of the Wenning and Greeta and their inflowing ghylls was of special interest. Whilst a flora rich in species was not to be expected on these grit rocks, the comparison of the vegetation here with that found on similar geological formations in the more populous part of the country was of interest. In the part investigated the flora was enriched by the occurrence of several species which are usually associated with the presence of calcium.

The most interesting species seen on the excursion up the Wenning was *Saxifraga Geum*, which was found in Gill Beck, where it has evidently been established for many years. Beech Fern and the Great Horsetail were seen, and Globe Flower, Wood Geranium and Herb Paris occurred in small quantity. At Lower Bentham *Poa nemoralis* was plentiful and in good flower in the woods, whilst the hybrid, *Geum intermedium*, Adder's Tongue Fern, Butterwort, Mealy Primrose, Dyer's Greenweed and Creeping Willow were also seen. The Oak woods below Burton-in-Lonsdale were notable for the great quantities of *Luzula sylvatica* which was dominant over large areas. Here Wood Stitchwort, Alternate-leaved Golden Saxifrage, Great Horsetail, Pendulous Sedge, Bird's-nest Orchid, and an oak-leaved variety (var. *quercifolia* Ait.) of the common Honeysuckle, which is apparently new to the county, were among the most interesting plants seen.

The following list includes the rarer species noted, together with several more widely distributed plants which it seems desirable to put on record for this area. None of the species noted in the circular as requiring confirmation was seen.

1. RIVER WENNING ABOVE BENTHAM AND GILL BECK.

<i>Trollius europæus</i> L.	<i>Veronica montana</i> L.
<i>Cardamine amara</i> L.	<i>Paris quadrifolia</i> L.
<i>Geranium sylvaticum</i> L.	<i>Carex remota</i> L.
<i>Saxifraga Geum</i> L.	<i>Phegopteris polypodioides</i> Fée.
<i>Crepis paludosa</i> Moench.	<i>Phyllitis Scolopendrium</i> Newm.
<i>Mimulus guttatus</i> D.C.	<i>Equisetum maximum</i> Lam.

2. LOWER BENTHAM.

Trollius europæus L.
Cardamine amara L.
Sagina apetala Ard.
Genista tinctoria L.
Geum intermedium Ehrh.
Agrimonia odorata Mill.
Crepis paludosa Moench.
Primula farinosa L.

Pinguicula vulgaris L.
Mimulus guttatus D.C.
Salix repens L.
Carex remota L.
C. fulva Host.
C. pallescens L.
Poa nemoralis L.
Ophioglossum vulgatum L.

3. BURTON-IN-LONSDALE.

Cochlearia alpina Wats.
Stellaria nemorum L.
Chrysosplenium alternifolium.
Lonicera Periclymenum L. var.
quercifolia Ait.
Neottia Nidus-avis Rich.

Carex acutiformis Ehrh.
C. pendula Huds.
Milium effusum L.
Phegopteris Dryopteris Fée.
P. polypodioides Fée.
Equisetum maximum Lam.

Bryology : Mr. F. E. MILSOM writes : Although it was not to be expected that the district investigated would yield results as good as those of a limestone area, yet the richness of the bryological flora of this Millstone Grit district was surprising when contrasted with similar districts in south-west Yorkshire. It has to be noted, however, that the limestone is very near, and the common occurrence of such lime-loving plants as *Hypnum commutatum* and *Weisia verticillata* suggests that lime in small quantities may have some influence on the general flora. Of the plants seen, the most generally interesting was *Tetraphis Browniana* in fruit, which was frequent throughout the district. The rarest moss was *Campylostelium saxicola*, which it was very gratifying to see. *Pylaisia polyantha* was another rarity which has been known in its present habitat for a number of years. Other good mosses were *Hypnum patientiæ* and a peculiar form of *Racomitrium canescens* var. *ericoides* in which the hair-points were almost obsolete. Of the hepatics the best were *Lophozia turbinata*, *L. Muelleri*, *Scapania umbrosa* and *Radula complanata*, which last was growing near the *Pylaisia polyantha*.

Owing to the paucity of previous records for the district, a complete list is given of species noted.

MOSES.

Tetraphis pellucida Hedw.
T. Browniana Grev.
Catharinea undulata Web. & Mohr.
Polytrichum aloides Hedw.
P. urnigerum L.
P. piliferum Schreb.
P. formosum Hedw.
P. commune L.
Seligeria recurvata B. & S.
Brachyodus trichodes Fuernr.
Ceratodon purpureus Brid.
Dichodontium pellucidum Schp.
Dicranella heteromalla Schp.
D. squarrosa Schp.
Blindia acuta B. & S.
Dicranoweisia cirrata Lindb.
Dicranum scoparium Hedw.
D. majus Turn.
Fissidens pusillus Wils.
F. crassipes Wils.
F. bryoides Hedw.
Racomitrium canescens Brid. var.
ericoides B. & S.

Campylostelium saxicola B. & S.
Tortula subulata Hedw.
Barbula rubella Lindb.
B. revoluta Brid.
B. convoluta Hedw.
B. unguiculata Hedw.
B. tophacea Mitt.
Weisia tenuis C.M.
W. rupestris C.M.
W. verticillata Brid.
Encalypta streptocarpa Hedw.
Philonotis fontana Brid.
Breutelia arcuata Schp.
Bryum pseudo-triquetrum Schwaeg.
B. capillare L.
Mnium affine Bland.
M. undulatum L.
M. hornum L.
M. punctatum L.
Fontinalis antipyretica L.
Neckera crispa Hedw.
N. complanata Huebn.
Homalia trichomanoides B. & S.

MOSESSES.—continued.

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|---|-------------------------------------|
| <i>Pterygophyllum lucens</i> Brid. | <i>Plagiothecium elegans</i> Sull. |
| <i>Porotrichum alopecurum</i> Mitt. | <i>P. denticulatum</i> B. & S. |
| <i>Heterocladium heteropterum</i> B. & S. | <i>Amblystegium serpens</i> B. & S. |
| <i>Thuidium tamariscinum</i> B. & S. | <i>A. filicinum</i> De Not. |
| <i>Pylaisia polyantha</i> B. & S. | <i>Hypnum commutatum</i> Hedw. |
| <i>Brachythecium rutabulum</i> B. & S. | <i>H. cupressiforme</i> L. |
| <i>B. purum</i> Dixon. | <i>H. Patientiæ</i> Lindb. |
| <i>Hyocomium flagellare</i> B. & S. | <i>H. molluscum</i> Hedw. |
| <i>Eurynchium praelongum</i> Hobk. | <i>H. cuspidatum</i> L. |
| <i>E. myosuroides</i> Schp. | <i>Hylocomium splendens</i> B. & S. |
| <i>Eurynchium striatum</i> B. & S. | <i>H. squarrosum</i> B. & S. |
| <i>E. rusciforme</i> Milde. | <i>H. triquetrum</i> B. & S. |

HEPATICS.

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| <i>Conocephalum conicum</i> (L.) Dum. | <i>Lophocolea cuspidata</i> Limpr. |
| <i>Aneura pinguis</i> (L.) Dum. | <i>Chiloscyphus polyanthus</i> (L.) Corda |
| <i>Pellia epiphylla</i> (L.) Corda. | <i>Cephalozia bicuspidata</i> (L.) Dum. |
| <i>P. Fabbriana</i> Raddi. | <i>Calypogeia Trichomanis</i> (L.) Corda |
| <i>Marsupella emarginata</i> (Ehrh.)
Dum. | <i>C. arguta</i> Nees, et Mont. |
| <i>Alicularia scalaris</i> (Schräd.) Corda. | <i>Lepidozia reptans</i> (L.) Dum. |
| <i>Aplozia riparia</i> (Tayl.) Dum. | <i>Diplophyllum albicans</i> (L.) Dum. |
| <i>Lophozia turbinata</i> (Raddi.) Steph. | <i>Scapania nemorosa</i> (L.) Dum. |
| <i>L. Muelleri</i> (Nees.) Dum. | <i>S. dentata</i> Dum. |
| <i>L. ventricosa</i> (Dicks.) Dum. | <i>S. undulata</i> (L.) Dum. |
| <i>L. Floerkii</i> (Web. et Mohr.)
Schiffn. | <i>S. umbrosa</i> (Schräd.) Dum. |
| <i>Plagiochila asplenoides</i> (L.) Dum. | <i>Radula complanata</i> (L.) Dum. |
| <i>P. asplenoides</i> var. <i>major</i> Nees. | <i>Lejeunea cavifolia</i> (Ehrh.) Lindb. |
| <i>P. asplenoides</i> var. <i>major</i> f.
<i>subintegerrima</i> Schiffn. | <i>Microlejeunea ulicina</i> (Tayl.) Evans |
| | <i>Frullania Tamarisci</i> (L.) Dum. |
| | <i>F. dilatata</i> (L.) Dum. |

Mr. W. H. BURRELL, F.L.S., sends the following additional bryophytes :

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|-----------------------------------|---|
| <i>Fissidens viridulus</i> Wahl. | <i>Heterocladium heteropterum</i> B. & S. |
| <i>F. crassipes</i> Wils. | <i>Hyocomium flagellare</i> B. & S. |
| <i>Barbula tophacea</i> Mitt. | <i>Aplozia pumila</i> (With) Dum. |
| <i>Zydodon viridissimus</i> R.Br. | <i>Chiloscyphus polyanthus</i> var. <i>rivularis</i> Nees.? |

Lichens : Mr. W. E. L. WATTAM writes :

BENTHAM.—The prevalent silicious grit of walls and scattered rock masses of the Millstone Grit series yielded a typical saxicolous growth of lichens seen here to much better perfection than in those parts of South-west Yorkshire where similar geological stratas prevail and where still exist some of the species mentioned below. The more aged trees of oak, ash, mountain elm, alder and mountain ash were not too generously clothed with lichens, but nevertheless they gave corticolous species which denizen such a habitat when conditions are favourable to their existence. In the township old concrete-covered walls had a prominent association of *Lecanora galactina* Ach and *Candelariella vitellina* Müll-Arg. The species noted from Bentham southward along the banks of the River Wenning to Mewith were as follows :—

- Candelaria concolor* Wain. Old palings.
Parmelia physodes Ach. Abundant on old trees and walls.
P. saxatilis Ach. and its f. *furfuracea* Schaer. Old trees and walls.
P. sulcata Tayl. Abundant on old trees.
P. fuliginosa Nyl. Walls and rock masses. The variety *latevirens* Nyl. on old trees and palings.
Cetraria laevis Ach. Abundant on old trees.

Evernia prunastri Ach. Old trees.
E. furfuracea. Walls.
Usnea florida Web. Rare on old trees.
Xanthoria parietina Th. Fr. and its f. *congranulata*. Trees, palings, roof tiles.
Placodium citrinum Hepp. Old trees, mortar of walls.
Candelariella vitellina Müll-Arg. Walls, palings and concrete facies.
Physcia hispida Tuckerm. Old trees and walls.
Lecanora muralis Schaer. Old trees and rock masses.
L. subfusca Ach. Old trees.
L. campestris B. de Lesd. Old walls.
L. atra Ach. Walls.
L. galactina Ach. subsp. *dissipata* Nyl. Concrete facies.
L. varia Ach. Old palings.
L. conizæa Nyl. Old palings and old trees.
L. symmictera Nyl. Old palings.
L. polytropa Schaer. Walls.
L. parella Ach. Walls.
Pertusaria pertusa Dalla T. & S. Trees.
Diploschistes scruposus Norm. Walls.
Cladonia pyxidata Hoffm. Bases of walls and trees.
C. fimbriata Fr. Amongst mosses on the ground.
C. gracilis Willd. and var. *chordalis*. Amongst mosses on the ground.
C. coccifera Willd. On turf base of walls.
C. macilenta Hoffm. Amongst mosses on the ground.
Lecidia coarctata Nyl. Walls.
L. contigua Fr. and var. *platycarpa* Fr. Rock masses.
L. sanguinaria Ach. Walls.
Verrucaria muralis Ach. Mortar of old walls.

BURTON-IN-LONSDALE.—The area set apart for investigation along the banks of the River Greeta provided quite a rich display of lichens due in part to the softer sandstone walls with a slight intermingling of calcareous stones. Practically the whole of the species previously listed were seen and the following additions made, viz :

Collema pulposum Ach. Amongst limestone chippings at wall bases.
Parmeliella plumbea Wain. On mossy walls.
Peltigera canina Willd. Amongst mosses on wall tops and moss-covered boulders in the wood.
P. polydactyla Hoffm. Very fine indeed in association with the mosses *Brachythecium purum* and *Hylocomium splendens* covering shale waste heaps.
Parmelia physodes var. *tubulosa* Mudd. Old trees.
Placodium callopismum Mer. On limestone gatepost.
Pertusaria globulifera Nyl. Old trees.
Bæomyces rufus D.C. In excellent fruit on sandstone wall tops.
Cladonia flabelliformis Wain. Amongst mosses, tree base.
Lecidia confluens Ach. Walls.
Bacidia umbrina B. & R. Walls.
Opegrapha atra Pers. Bark of young ash trees.
Verrucaria nigrescens Pers. Walls and mortar.

Plant Ecology (A. MALINS SMITH) : Though the Bentham district lies entirely on Millstone Grit, certain features of the vegetation struck the ecologist at once as exceptional in such a soil. These features were :

- (1) the abundance of certain flowering plants which are characteristic of a less acid soil than normally develops over this rock, e.g. Woodruff, Sanicle, Garlic, and Early Purple Orchid.
- (2) the scarcity of Bracken and Wood Soft grass, though Bluebell was common.
- (3) the presence of mosses of a lime-loving character.

- (4) the formation of calcareous tufa in many places both by mosses and algae.

These features all pointed to a supply of calcareous matter in the mill-stone grit of this region, whether of a surface nature due to glacial action or from a more deep-seated source. The normal woodland of the surface of the region was the oak-birch wood, but wherever rivers or streams had cut down a channel, often steep-sided, to some depth below the surface, there these evidences of the presence of calcareous matter were shown. The woods examined by the River Wenning on Saturday and Sunday and by the River Greeta on Monday all had certain features in common (1) the presence of oak and birch, usually at the top of the slope ; (2) the abundant admixture of ash and elm on the steeply sloping sides ; (3) the presence of flowering-plants and mosses characteristic of a neutral or basic soil ; (4) the formation of calcareous tufa by mosses and by algae where, as frequently occurred, water oozed out or welled out of the rock.

These features are accounted for if we suppose that the surface soil either was never limy or has had its calcareous matter leached out of it, while the underlying strata are still yielding calcareous matter which shows itself in the drainage water which comes out in frequent places on the steep-sided channels cut by the streams.

These woods then were of very mixed character showing in the tree layer the oak, the birch, the ash, the elm, and the alder. The shrub layer consisted of hazel, hawthorn, holly, bird-cherry, and apple, with occasional rowan and guelder-rose. The ground vegetation showed chiefly Garlic, Sanicle, Dog's Mercury, Woodruff, Anemone, Earthnut, Early Purple Orchid, with Bluebell frequent in some spots. A feature was the frequency of *Deschampsia caespitosa*, the Tussock grass, an effect probably of the dampness of both soil and climate. The finding of Globe flower, *Geranium sylvaticum*, and Herb Paris, chiefly by the edge of the rivers was probably to be accounted for by the fact that both the Wenning and the Greeta flow from mountain limestone regions and therefore leave a basic deposit by the sides of these streams, though in some places Paris was higher above the river and should probably take its place as one more indicator of the supply of lime in the grit itself which has already been emphasised. Other plants frequent or occasional were Cuckoo Pint, Broad-leaved Bellflower, Primrose, Herb Bennet, Goldilocks, Twayblade, Moschatel, showing fruit, Black Bryony, and Wood Stitchwort. In the wetter places were Bugle, Marsh Thistle, Water Avens, Marsh Valerian, Celandine, and Meadowsweet.

On Sunday, in a gill above Lower Bentham we touched a more typical dry oakwood vegetation. Here Foxglove was seen and a little Wavy Hair-grass crept in, also some Bracken with Hard Fern and Yellow Pimpernel. In the tree layer Ash was much less common and planted Pine frequent. Even here, however, the steep slope to the stream showed in one place abundant Woodruff and *Brachypodium sylvaticum* and there was some Sanicle and Dog's Mercury. *Deschampsia caespitosa* was common here also. A very striking feature of the woods by the River Greeta below Burton was the abundance of *Luzula sylvatica* which formed an almost pure association on the steep slopes growing in a rather heavy soil. This feature, as well as the presence of *Carex pendula*, reminded me of the Raincliff and Forge Valley woods near Scarborough.

The composite character of the soil and the presence of basic soil-loving elements of the flora where water comes to the surface were also shown quite away from the woodland, in a very interesting small bog to which we were conducted. Here Bird's Eye Primrose, Butterwort, and Grass-of-Parnassus, all characteristic plants of bogs formed by calcareous waters, were found. Only a yard or two away, however, where accumulation of humus had raised the soil above the influence of the moving water, an acid tendency had developed, and Matgrass and Ling were common with *Orchis elodes*. Other plants in this mixed bog

association were Dyer's Greenweed, Devil's Bit, Marsh Valerian, Gorse, Sneezewort, *Hypericum pulchrum*, *Luzula congesta*, *Salix repens*, and *Molinia cerulea*.

This mixture of lime-loving and peat-loving plants is common wherever a bog is formed by calcareous waters, basic-soil plants being found by the moving waters of the streams and acid and peat-loving plants in the stagnant areas between.

A characteristic of all the woodlands examined was the frequency of seedlings, so that natural regeneration of the woodland is taking place. The following seedling trees were seen; Ash, Sycamore, Birch, Elm, Oak, Hawthorn, Alder, and Ivy; Ash, and Hawthorn being on the whole the most frequent.

Entomology: Mr. ROSSE BUTTERFIELD says: Whit Monday was not a good day for insects. On the banks of the river from the bridge at Burton and thereabouts the following only were noted:

LEPIDOPTERA.—*Hepialus hectus*, *Arctia menthastris*, *Rumia cratoegata*, *Asthenes luteata* (now getting rather rare in West Yorkshire), *Cabera exanthemaria*, *Panegra petrarica*, *Abraxus ulmata*, *Melanippe galiata*, *M. montanata*.

HYMENOPTERA.—*Lasius umbratus*, *L. flavus*, *Myrmica rubra*, *Bombus lapidarius*, *B. hortorum* and *Vespa norvegica*.

Coleoptera: Mr. M. D. BARNES writes: The weather experienced at the Bentham meet of the Y.N.U. was not ideal for the entomologist from a collecting point of view.

Saturday was very windy and most of the insects collected in sheltered hollows. Sunday was by far the best day, and most of the beetles recorded were taken then. Monday, when we visited the valley of the River Greeta, working both banks of the river for about one and a half miles below Burton-in-Lonsdale, was very disappointing, as rain had fallen heavily in the early morning, and as the day was damp and overcast, the vegetation, especially in the woods, was very wet, making sweeping an unpleasant and not very profitable task.

As most work was done with the sweeping net most of the beetles recorded are those which frequent plants, few ground beetles being met with.

The genus represented by the largest number of species was *Cantharis*, of which five species were taken. This genus comprises the well-known "Soldier Beetles," so common on the wing in June and July.

Of the *Sternoxia* (Click Beetles), only four of the most common species were found. It is rather surprising that *Corymbites cupreus* and *C. pectinicornis* were not found on the moors above Bentham, as these rather handsome species are usually very common at this time of the year on the rough grass of the Gritstone Moors.

Another interesting and well-known beetle taken was *Melolontha melolontha*, the "Cock Chafer." This beetle was found both on Saturday by the Wenning and on Monday by the Greeta. It appeared to be most common in the woodlands which border the Greeta, in which woods several specimens were observed on the footpath crushed.

The complete list of species taken is as follows:

<i>Phyllobius viridicollis</i> (Fab.).	<i>Grammopterus ruficornis</i> (Fab.).
<i>P. glaucus</i> (Scop.).	<i>Chrysolina polita</i> (Lin.).
<i>Cionus scropulariæ</i> (Lin.).	<i>Hydrothrassa marginella</i> (Lin.).
<i>Aphodius fossor</i> (Lin.).	<i>Crepidocera</i> — ?
<i>Melolontha melolontha</i> (Lin.).	<i>Cantharis hæmmorrhoidalis</i> (Fab.).
<i>Gyrinus substriatus</i> ?	<i>C. nigricans</i> (Müll.).
<i>Leistus rufescens</i> (Fab.).	<i>C. bicolor</i> (Hbst.).
<i>Europhilus fuliginosus</i> .	<i>C. pellucida</i> (Fab.).
<i>Abax ater</i> (Vill.).	<i>Rhagonycha lignosa</i> (Müll.).
<i>Anchomenus assimilis</i> (Pk.).	<i>Denticollis linearis</i> (Lin.).

Adrastus nitidulus (Marsh.).*Halyzia 14-guttata* (Lin.).*Athous hæmmorhoidalis* (Fab.).*Coccinella 7-punctata* (Lin.).*Dolopius marginatus* (Lin.).*C. bipunctata* (Lin.).

Diptera : Possibly the most interesting fly seen was *Atherix ibis* F., but we did not succeed in finding the masses of dead females and eggs that are depicted on p. 480, *Insects Part II of the Cambridge Natural History*. At Burton a fortnight later I got the very little known *Orimarga virgo* Zett. and *Dicranomyia aquosa* Verr. We saw a good many species of *Tipula*, including *T. montium* Egg., *T. lateralis* Mg., *T. unca* Wied., *T. oleracea* L., *T. flavolineata* Mg., *T. varipennis* Mg., *T. maxima* Pod., *T. vernalis* Mg., *T. irrorata* Mcq., *T. variicornis* Schum., *T. scripta* Mg., *T. fascipennis* Mg., also *Pachyrrhina analis* Schum., *P. crinicanda* Rdl., *P. quadrifaria* Mg., the large *Pedicia rivosa* L. was plentiful, and the black *Ptchoptera paludosa* Mg., *P. albimana* Fab. and *P. lacustris* Mg., and the dark body and legs with white tarsi of *Dolichopeza sylvicola* Curt. were often seen. Other Limnobiids are *Dicranomyia ornata* Mg., *D. modesta* Mg., *D. pilipennis* Egg., *D. chorea* Mg., *D. aquosa* Verr., *Limnobia tripunctata* F., *L. flavipes* F., *L. nubeculosa* Mg., *Molophilus cinereifrons* Meij., *M. armatus* Meij., *Dasymolophilus murinus* Mg., *Gonomyia tenella* Mg., *G. simplex* Tonn., *Rhipidia maculata* Mg., *Ephelia marmorata* Mg., *Ormosia lineatus* Mg., *Acyphona maculata* Mg., *Limnophila nemoralis* Mg., *L. ochracea* Mg., *Epiphragma picta* F., *Rhamphidia longirostris* Mg.

Amongst the fungus gnats were *Macrocera fasciata* Mg., *M. stigma* Curt., *M. phalerata* Mg., *Mycomyia ornata* Mg., *Boletophila cinerea* Mg., *Neuratelia nemoralis* Mg., *Boletina trivittata* Mg., *B. Reuteri* Lnst. The Empids include *Rhamphomyia nigripes* Fab., *R. flava* Fln., and the Dolichopods. *Psilopus platypterus* Fab., *Dolichopus brevipennis* Mg., *D. plumipes* Scop., *D. unguiculatus* L., *D. trivialis* Hal., *Sympycnus annulipes* Mg. The two Clegs, *Hæmatopota pluvialis* L. and *H. crassicornis* Whlbg., were felt as well as seen, and other diptera were *Chrysopilus cristatus* Fab., *Dixa nubilipennis* Curt., *Platychrius clypeatus* Mg., *Beris Morrisii* Dale., *B. vallata* Forst., *B. chalybeata* Forst., *Tetanocera lævifrons* Lw., *T. elata* Fal., *T. punctulata* Scop., *Callimyia amoena* Mg., *Herina frondescens* L., *Sapromyza decempunctata* Fln., *S. inusta* Mg.

The only Dragonflies seen were *Agrion puella* L. and *Pyrrhoxoma nymphula* Sulz.

THE FIRST CONGRESS OF BRITISH ENTOMOLOGY

W. D. HINCKS, M.P.S., F.R.E.S., M.S.B.E.

THE progressive Society for British Entomology held its first Annual Congress at Oxford on July 12th—15th, with the co-operation of the Ashmolean Natural History Society of Oxfordshire.

Upwards of seventy visitors attended the various functions of the well-arranged programme under the chairmanship of Professor G. D. Hale Carpenter, Hope Professor of Zoology in the University of Oxford.

Congress was opened by Professor Sir Edward B. Poulton followed by Professor Carpenter's presidential address 'Courtship and allied problems in Insects.' Other papers read in the course of the meetings embraced such diverse subjects as Migration, Mimicry, Economic Entomology and Wegener's theory.

Besides some interesting exhibits brought by visitors, series of biological material from the incomparable Hope Museum collections were on view and were fully explained by Professor Carpenter and Dr. B. M. Hobby.

Social gatherings for lunch and dinner were held at Jesus College where a number of the visitors were staying.

Finally on Monday, July 15th, a field meeting was held in the classical Bagley Woods, Berks., and despite the lack of insects this feature was

enjoyed by everyone and culminated in a substantial tea provided by the Ashmolean Society in the Hunting Lodge.

Thus closed the first Congress of British Entomology and may it be the first of a long series.

It is to be hoped that this Annual Gathering will become more widely known and supported, as it should make a strong appeal to all interested in any aspect of British Entomology.

All those who contributed to the success of the Congress and its organisation are to be heartily congratulated for their efficient and careful work.

We believe that an invitation has been received for the Society for British Entomology to make Cambridge its venue for 1936.

REVIEWS AND BOOK NOTICES

Geological Memoirs: Bristol and Gloucester District, by F. B. A. Welch and R. Crookall, pp. vi+90, with 12 plates and 27 figures. **London and Thames Valley**, by R. L. Sherlock, pp. iv+70, with 5 plates and 24 figures. **The Wealden District**, by F. H. Edmunds pp. viii+85, with 13 plates and 21 figures. These memoirs are published by His Majesty's Stationery Office under the direction of the Department of Scientific and Industrial Research and are priced at 1/6 each. They may, of course, be obtained through any bookseller. Apart altogether from the fact that these memoirs bring up to date the geological information about the districts described, they show a notable advance in the method of presentation of an important subject. They are profusely illustrated and both photographs and diagrams are extremely well reproduced and to the point. The block diagrams (3 dimensional) are particularly valuable. Economic products are dealt with at length and each memoir has a very complete bibliography including not only the maps and memoirs published by the Geological Survey, but important and useful non-survey publications such as geological excursion hand-books and guides.

Hull Museum Publications, No. 182: Excavations at the Roman Fort at Brough-on-Humber, by Philip Corder. Reprinted from the *Transactions of the East Riding Antiquarian Society*. Copies can be obtained from the Museum, Hull, and from the Registrar, University College, Hull, price 1/-, postage extra. This is a very complete account, well illustrated, of Mr. Corder's fine work at Brough in 1933. The excavations were considerable and a quantity of valuable material of Roman origin was examined. The whole is recorded in detail in the pamphlet, and thanks are due to the Hull Museum authorities for re-printing at a low price results of such interest and importance. **No. 183: What to see in the Hull Museums**, by T. Sheppard. Price 1d. A well-illustrated pamphlet which amply justifies its title. **No. 184: Record of Additions**, by T. Sheppard. This pamphlet is a collection of reprints from various sources descriptive of the many recent acquisitions of the Hull Museums.

Everyday Biology, by F. L. Fitzpatrick and R. E. Horton, pp. 610 and xlv, 266 figs., 8/6 net. (Constable.) This book is designed as a final school text-book, designed to lead to some understanding of the basic biological principles which control life on the earth. It is widely drawn and sound in subject matter, well and profusely illustrated and in style obviously owes some inspiration to the *Science of Life*. It covers the whole range of biology, and the problems discussed are grouped under the headings, protoplasm and cell structure, energy relations, adaptations of behaviour and structure, reproduction, plants and animals in relation to human affairs. This book may be recommended for school use.

Stereoscopic Photography, its Application to Science, Industry and Education, by **Arthur W. Judge**, 2nd, revised and enlarged edition, pp. xii+340, with 231 figures in the text. 21/-. (Chapman and Hall). This fine work is a timely reminder that stereoscopic photography is not dead. Naturalists who have examined stereos of birds, flowers, insects, etc., will agree that no other method of pictorial presentation approaches the realism of such photographs. Then stereoscopic photography is invaluable to the surgeon and to a large number of other scientific workers. In this book we have a most complete account of a fascinating subject, beginning with causes of stereoscopic vision and photographic principles and then going on to deal with the practical side of the subject in a most comprehensive manner. The work is very fully illustrated and should prove of great interest to all naturalists, particularly those who use photography as an aid to their work.

The Arachnida, by **Theodore H. Savory, M.A.**, pp. xii+218, with 8 plates and 99 figures in the text, 25/-. (Edward Arnold). This most erudite treatise, together with the author's recent "Spiders and Allied Orders" (Wayside and Woodland Series), will provide the British arachnologist with practically all the help he will need from books. Those who know Mr. Savory's other valuable works on Spiders will welcome this fine volume. Mr. Savory aspires to give arachnology a scientific status comparable to that held by entomology and he has succeeded very well indeed. The whole class is described at great length, details are given of the various Orders and Families, and economic and other aspects of the science are dealt with. It is refreshing to find such an advanced book as this so eminently readable, and the illustrations are entirely appropriate and extremely well done. At the end of the book there is a comprehensive bibliography.

NEWS FROM THE MAGAZINES

The Transactions of the Society for British Entomology, Vol. II, Part I, contain 'A key to the members of the family Bruchidae (Col.) of economic importance in Europe,' by G. M. Herford (with four plates); 'Notes on Ichneumonidae (Hym.) new to or rare in Britain: with a brief review of British Lists published since 1915,' by G. J. Kerrich (twenty-three species noted and a copious bibliography given); 'A record of the Hemiptera Heteroptera at the Imperial College Biological field station, Slough, Bucks, with notes on their food,' by W. H. Goddard (a valuable contribution); 'The Trichoptera of the Oxford district,' by the Rev. Professor L. W. Grensted (forty-seven species noted); '*Bombus muscorum* (Linnaeus) and *B. smithianus* White (Hym.),' by O. W. Richards (the separation of the species discussed and notes on variation given with plate of the distribution of bees and rodents) and 'A provisional list of Cornish insects. Part II. Diptera (Syrphidae, Tachinidae, and Muscidae),' by the Rev. A. Thornley (numerous rare species noted including *Chilosia mutabilis*, *Platychirus sticticus*, *Syrphus diaphanus*, *Eristalis abusivus*, *Sarcophaga hirticrus*, *Ernestia connivens*, *Actia bicolor*, *Helina parcepulisa*, *Chortophila insignis*, *Pycnoglossa signata*, and *Heterostylus atomarius*).

The Entomologist for July contains 'In Memoriam. Robert Adkin' (with plate); '*Bactra lanceolana* Hub. and *B. scirpicolana* spec. nov. (Lep. Tortricidae),' by F. N. Pierce and J. W. Metcalfe (*B. Scirpicolana* from Dawlish Warren, Devon, and Burnham-on-Sea, Essex); 'The Brown Argus (*Aricia agestis*); III Salmacis—Artaxerxes,' by W. Carter; 'Remarks on the names of some British Odonata,' by J. Cowley; 'Superposition of pattern components in a species of amathusiid butterflies,' by B. N. Schwanwitsch; 'Migration records, 1935,' by Captain T. Dannreuther (including a record of *Acherontia atropos* from Holy Island, Northumberland), and numerous Notes and Observations.

The Entomologist's Monthly Magazine for July contains 'The parasites of British birds and mammals. IV. Records of Bat parasites,' by G. B. Thompson; 'New species and forms of African Lycaenidae (Lep. Rhop.),' by G. Talbot; 'Notes on the Galleriid moth *Corcyra cephalonica* Stainton,' by J. M. Nicol (with figures); 'A suggested explanation of variation in cryptic lepidoptera,' by G. V. Hudson; 'On some Hemiptera new to Britain,' by W. E. China (*Acompus opacus* Priesner from Colchester (Harewood), *Peritrechus angusticollis* Sahlb. from Studland (Harwood), and *Drymus pumilio* Put. no locality given: three new country records are also given). "(I) Two further records of the association of Hippoboscidae and Mallophaga. (II) An anthocorid bug feeding on *Dermanyssus gallinae* (Redi),' by G. B. Thompson. (The anthocorid bug is *Triphleps majuscula*.) 'The British Tullbergiinae, Pt. I,' by R. S. Bagnall, and several short notes.

The Transactions of the British Mycological Society, Vol. 19, iv, for June, contains articles on the life histories of three species of *Cephalotheca* Fuck., by C. G. C. Chesters; the fungi of Wickern Fen, by E. J. H. Corner; the occurrence of *Pyrenophora avenae*, Ito., in Scotland, by R. W. G. Dennis; on variation in *Thamnidium elegans* Link. induced by the action of high temperatures, by B. Barnes; a list of fungi, etc., maintained in the National Collection of Type Cultures, 1935, by R. St. John-Brooks and Mabel Rhodes; a new species of *Glomerella* on tea, by A. C. Tunstall; and the presence of the endophymtic fungus in *Lolium* spp., by Kathleen Sampson.

The Ministry of Agriculture and Fisheries Fishery Investigations, Series II, Vol. XIV, No. 4, is a report by Dr. J. N. Carruthers on the flow of water through the Straits of Dover. It summarises continuous records taken from the Varne light vessel between 1928 and 1935. In brief there is an average drift through the Straits to the North East just exceeding three miles per day. This varies very much with wind and season, being strongest in November and weakest in February. The original paper should be examined for data and also for a very suggestive appendix dealing with the relation between the results and fisheries in the North Sea.

The Entomologist's Record for July-August contains 'Notes on a rare publication by Jacob Hubner and its effect upon modern interpretation of Hubnerian nomenclature,' by F. H. Benjamin; '*Pancalia latreillella* Curtis,' by T. B. Fletcher; 'The genus *Athetis* Hb. (*Caradrina* Ochs. and Tr.)'; 'A holiday in Piedmont,' by H. G. Harris; 'An account of my studies in the biology of *Pieris rapae*, III,' by O. Querci; 'Two visits to Finland,' by E. Scott; 'Notes on collecting, etc.'; 'Current Notes and short notices'; 'Obituary—Robert Adkin, F.R.E.S.'; and supplements, 'Notes on the early stages of some Syrian Lepidoptera (Plate III),' by E. P. Wiltshire; 'The British Noctuae and their varieties,' by H. J. Turner; and 'Butterflies of the Upper Rhone Valley,' by R. Verity.

The Entomologist for August contains 'The variation of *Eucosma solandriana* L., *E. brunnichana* L. (= *sinuana* Schiffermuller and Hubner), and *E. piceana* Haw. (= *semifuscana* Stphs.) (Lep. Tortricidae),' by W. G. Sheldon; 'Notes on captures during 1934,' by S. Wakely; 'The Crabtree collection,' by W.R.S.; 'A new Indian caddis-fly (Trichoptera),' by M. E. Mosely; 'Migration records, 1935,' by Capt. T. Dannreuther (*Vanessa atalanta*, isolated specimens at Isle of Man and Sunderland. *Colias croceus*, one at Aviemore, Inverness. *Plusia gamma* at Alnmouth); 'Notes on the geographical variations of *Argynnis aglaja* L.,' by R. Verity; 'Trichoptera, Plecoptera, and Neuroptera, etc., in the Hautes-Pyrenees and the Haute-Garonne,' by M. E. Mosely; and 'Notes and observations,' including 'Podagricra fuscicornis attacking hollyhocks,' by F. D. Welch.

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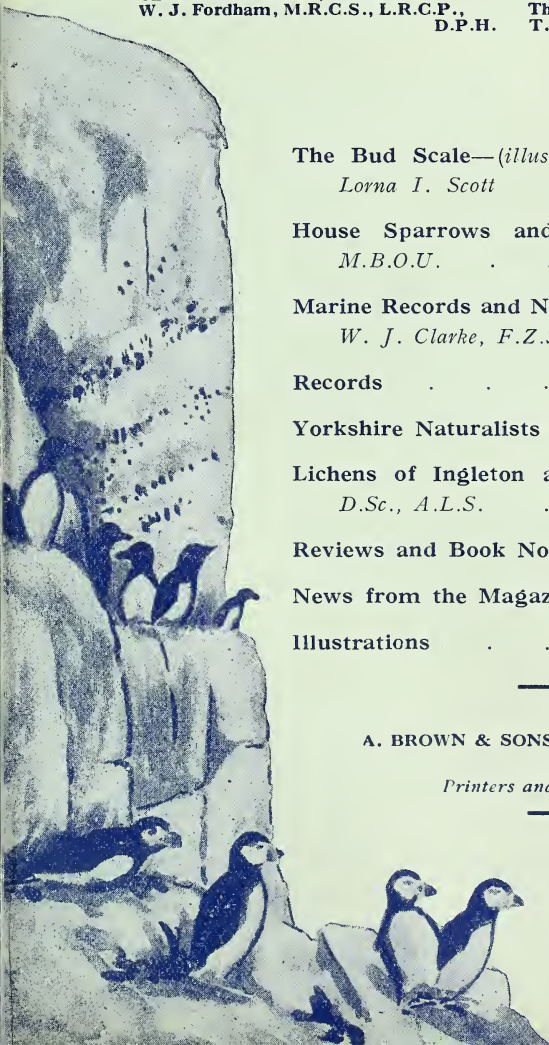
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YORKSHIRE NATURALISTS' UNION.

Y.N.U. BOTANICAL SECTION.

The Sectional Meeting will be held in Room 29, Botanical Department at Leeds University, on Saturday, October 12th, at 3-30. The Annual Report will be discussed and the Sectional Officers nominated; in the evening, Mr. A. Malins Smith will read a paper on:—

“INTERMITTENT FLOWERING”

and Dr. W. A. Sledge will show some Central European plants. Other exhibits or communications will be welcome.

Austwick
via Lancaster.

CHRIS. A. CHEETHAM,
Hon. Secretary.

VERTEBRATE SECTION.

TWO MEETINGS will be held in the Library of the Church Institute, Albion Place, Leeds, on Saturday, October 19th, 1935, at 3-15 and 6-30 p.m.

At 3-15 p.m., to consider and pass (a) Sectional Reports for 1935 and to elect officers for 1936; (b) The General and Financial Reports of the Yorkshire Wild Birds and Eggs Protection Acts Committee for 1935, and to recommend this Committee for 1936; (c) The Reports of the Yorkshire Mammals, Amphibians, Reptiles and Fishes Committee for 1935, and to recommend this Committee for 1936.

The following papers will be given:—

‘British Reptiles and Batrachians,’ by W. J. Clarke, F.Z.S. (illustrated).

‘Among the Pygmies of the Itura Forest,’ by F. H. Edmondson, F.Z.S. (motion pictures).

‘Filming the Rook,’ by J. R. Edwards (motion pictures).

Members and Associates are cordially invited to attend and to bring notes, specimens and lantern slides. Will Officers of Affiliated Societies kindly notify their members?

13 Chestnut Avenue,
York.

E. WILFRED TAYLOR,
Hon. Secretary,

ENTOMOLOGICAL AND PLANT GALLS SECTIONS.

THE ANNUAL MEETING will be held on Saturday, October 26th, at the Church Institute, Albion Place, Leeds, at 3 p.m. and 6 p.m.

Agenda:—3-5 p.m. Exhibition of Specimens.

6-8 p.m. (approx.) Recorders' Reports,
Nomination of Officers and
Business.

Members and visitors are invited to bring exhibits. Recorders are reminded of the desirability of presenting their reports at this meeting so that they may be handed to the General Secretary of the Union as early as possible.

46 Gipton Wood Avenue,
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W. D. HINCKS,
Hon. Sec.

THE BUD SCALE

J. H. PRIESTLEY AND LORNA I. SCOTT

I. THE BUD SCALE AND PROTECTION.

THE growing shoot of a flowering plant always has an apical growing region which may be regarded as a bud, but in the tree the bud is at times a very clearly defined structure as the young leaves within it are enclosed in specially modified foliar structures, the bud scales. In England, such buds are often spoken of as 'winter' buds, but similar buds may be found on the evergreen trees of a tropical rain forest where there is no period of rest corresponding with our winter.

There can be little doubt as to the foliar nature of the bud scales, though in many cases they differ widely in form and structure from the leaves of the same tree. Forms transitional between scales and leaves are frequently seen and the scales themselves are borne laterally on the axis in the same manner as the leaves of the same plant. Buds often occur in the axils of scales and also, when the scales fall they leave scars on the axis, similar in type to the leaf scars, though narrower in the vertical direction and crowded together through lack of internodal extension between them. Though always foliar in nature, morphological comparison suggests that they are comparable with different regions of the normal leaf in different species. For example the scales appear to be equivalent to:

- (a) a whole leaf, *e.g.* lilac, holly, privet.
- (b) the leaf base, *e.g.* horse chestnut, sycamore, ash.
- (c) the leaf base fused with a pair of stipules, *e.g.* apple, mountain ash.
- (d) a single stipule, *e.g.* beech, oak, sweet chestnut.

The association of the bud scales with the winter bud in temperate climates has led to their interpretation as foliar organs modified to serve a 'protective' function, by which the young leaf primordia within the bud are protected against some of the conditions of the winter season. The exact nature of the protective function is usually not specified and there seems to be little direct experimental evidence in support of this view and therefore considerable interest attaches to the work of Grüss⁽³⁾, who descaled buds early in winter and studied their capacity to survive. The experiments were carried out on twigs in water. He found that removal of the outer scales in oak led to the drying out and death of the inner scales and the leaf initials, even when moisture was present and the temperature did not fall. In beech the young leaves remain on much longer than in oak. In *Picea excelsa*, removal of the outer bud scales in March had not killed the

buds by the middle of April, but the inner scales had become thicker walled than usual. Buds of sweet chestnut and horse

TABLE I.

TREE.	BUDS DESCALED IN NOVEMBER AND COLLECTED THE FOLLOWING JUNE.					
	1930-31		1931-32		1932-33	
	Alive	Dead	Alive	Dead	Alive	Dead
<i>Acer Pseudo-Platanus</i> L.		11		17		4
<i>Aesculus Hippocastanum</i> L.	9	13	2	8		
<i>Betula alba</i> L.					1	16
<i>Castanea sativa</i> Mill.	9	12	2	7	7	2
<i>Fagus sylvatica</i> L.		7				19
<i>Fraxinus excelsior</i> L.			2 (very little growth)	1	9	2
<i>Populus canescens</i> Sm.	3	5	1	1		
<i>P. italica</i> Moench			1	3		
<i>P. serotina</i> Hartig						5
<i>Prunus Lauro-cerasus</i> L.					4	
<i>Pyrus Malus</i> L.		4				
<i>Quercus Robur</i> L.		4		8		
<i>Rhododendron</i> sp.						4
<i>Ribes sanguineum</i> Pursh			Some	(plant broken)	8	4
<i>Sorbus aucuparia</i> L.			7		11	3
<i>Syringa vulgaris</i> L.			5	5		
<i>Tilia vulgaris</i> Hayne		10		6	4	16
<i>Ulmus montana</i> Withering				5		

chestnut grew out in spite of the removal of all scales, and this he regarded as due to the covering of hairs which is present on the young leaves. From these experiments and others in which young plants, which had been forced, were taken out and exposed to cold, Grüss concludes that the main function of the bud scales is protection against evaporation from the

inner meristematic parts in the resting bud. In breaking buds a more important function is protection against excessive temperature changes, rather than against extreme cold, and this function is also performed to some extent by hairy coverings, which are particularly effective in cold winds.

There are very few observations available, particularly of experiments carried out upon trees in the open, in the light of which the protective theory of the bud scale may be examined. Therefore during the winters of the last few years experiments have been carried out, in which buds were descaled on the trees in the Weetwood area, north of Leeds, during the month of November and were examined in the following June. The results of these experiments are placed on record in Table I.

During this period, other workers have taken a record of the actual temperatures within buds. The results of these experiments will be published separately, but the records show clearly that the enwrapping scales have little influence upon the fluctuations of the internal temperatures of the buds.

Since May, 1933, Miss Dorothy Underwood has made observations upon the seasonal development of the scales and leaf primordia in the buds of several tree species and has considered the results from a standpoint which is briefly indicated in the next section.

DOROTHY UNDERWOOD AND LORNA I. SCOTT

II. THE BUD SCALE FROM THE STANDPOINT OF DEVELOPMENT.

From the standpoint of development, the bud scale may be regarded as evidence of a rhythm of events at the growing point of the shoot. This rhythm is characteristic of the tree and may or may not show a correlation with the external seasonal periodicity. An examination of the time of production of leaf and scale at the shoot apex may therefore throw some light upon their different form and structure. During 1926-28, Dr. A. S. Foster (²) dissected buds of horse chestnut (*Æsculus Hippocastanum* L.) at short intervals of time and his results may be summarised as follows:

April 1st to July 4th.—Development of the seven pairs of scales of the new buds.

July 4th to August 9th.—Development of foliage leaves for the next season.

August 9th onwards.—Period of 'rest.'

In occasional buds the formation of the first one or two pairs of scales took place during August and September, prior

to the 'rest' period. In all cases the foliage for the next season was all represented in the resting bud.

Comparison of these results with the observations on the expansion of the foliage showed that the swelling of the buds commenced on April 1st and this was soon followed by the bursting of the buds and the expansion of the foliage which continued into May. Thus during the time of expanding foliage, bud scales were being formed at the growing apices; before scale formation was replaced by leaf formation on July 4th, expansion of the foliage for the current season would certainly be complete.

These observations lead naturally to the conclusion that during shoot extension, so much of the available food and water is monopolised by the vigorously growing, leafy shoot that new primordia forming at the apex are restricted in development, so that scale primordia are produced instead of leaf primordia. By July 4th, the foliage will be fully expanded and extension growth at an end; food supplies from the adult leaves will now be passing to the shoot apex, where leaf primordia are now formed but do not grow out, probably owing to the summer deficiency of water. On this view the bud scale becomes the natural result of the rhythmic alternation of periods of shoot extension and food consumption with periods of food accumulation due to the activity of the expanded foliar canopy. This suggestion is based simply on these observations upon one species; further observations have therefore been made upon the buds of other trees.

SEASONAL OBSERVATIONS ON THE DEVELOPMENT OF FOLIAGE AND BUDS

During 1933-34, material was collected during May and June, and from October to March from trees at Weetwood, on the outskirts of Leeds. During the other months, owing to University vacations, the collections were continued near Worcester. The buds were either examined fresh or preserved in equal parts of fifty per cent. alcohol and fifty per cent. glycerine. The collections were made at fortnightly intervals during the greater part of the season, but more frequently during the very active period in spring and at longer intervals in the winter. Trees were selected to include types with scales of various morphological categories.

In spite of the discontinuity in the collecting, it was possible to draw up a time table, based on the dissections, showing the sequence of events in six different species of trees. The results are given in Table II.

In the case of ash, the sequence of events agrees with that described for horse chestnut and it will be seen that the first structures formed at the apex in the spring are bud scales and

TABLE II.

	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER
PRIVET	Buds swell	Continued formation of 5-18 pairs of foliage leaves for current year		↓ Formation of	Bud scales formed		Formation of 3-4 pairs of foliage leaves for resting bud	
LILAC	Buds swell	Formation of 4-13 pairs of foliage leaves for current season		↓ ↓ Formation of	Bud scales formed	5-6 pairs of foliage leaves formed for bud		
CHERRY		Buds swell	3-6 leaves formed for current year	↓ ↓ Formation of	Scales formed		8 leaves formed for bud	
HOLLY			Buds swell	2-3 leaves formed for current year	Scales formed	5-6 leaves formed for bud		
SWEET CHESTNUT		Buds swell	2-5 leaves formed for current year	↓ ↓ Scales formed for current year	8 foliage leaves formed for bud			
ASH			Buds swell	↓ Scales formed	5 pairs of leaves formed for bud			

The vertical arrows represent the approximate date at which shoot extension began.

that this process occurs simultaneously with the extension of the new shoot from the resting bud. As extension draws to a close, future foliage leaves are formed at the apex. In the other five types however, the sequence of events is very different for the first activity in the spring is the continued formation of foliage leaf primordia at the growing apex. But as the extension of the shoot from the resting bud begins, it is seen that leaf formation is soon replaced by scale formation. Cessation of extension, as in the other types, is associated with a reversion of the activity of the growing point to leaf formation. The leaves formed at the apex in early spring expand the same season and thus, unlike the horse chestnut and ash type, only a proportion of the season's foliage is represented in the resting bud.

Although the behaviour of different kinds of trees appears at first sight to be very different, it will be seen that from the point of view of the present argument, there is in fact agreement throughout, for in all cases scale formation follows closely upon extension and it seems reasonable to assume that these are causally connected.

THE MODIFICATION OF THE BUD SCALE.

In the course of dissection it becomes quite clear that leaf primordia and the primordia of bud scales arise in exactly the same manner, as small fold-like upgrowths on the side of the growing apex of the shoot. At this earliest stage it is not possible to recognise the nature of the primordium from its appearance, though this may usually be deduced from comparison with dissections at somewhat different stages. Also experience soon enables one to recognise very early differences between structures of the two categories.

In spite of varied interpretations of the early stages of leaf development, generally speaking, the order of development described by Trécul ⁽⁴⁾ may be accepted, in which he stated that the parts of the leaf develop in the order, the sheath (presumably equivalent to the leaf base and structures arising therefrom, such as stipules), the lamina, the petiole. The characteristics of the lamina are closely associated with the vein system and so also is the last phase of development, the formation and extension of the petiole.

In types where the scale is equivalent to an entire leaf, the young bud scales are especially difficult to distinguish, but in a type like lilac the leaf primordia comparatively soon show a narrowing of the base, which foreshadows the petiole, whilst the scales always retain a relatively broad base (Fig. 1). Similarly the leaf primordia soon show a differentiation into a thicker midrib region and the thinner wing of the lamina, whilst the scales remain of approximately the same thickness and show no midrib. With the better development of the

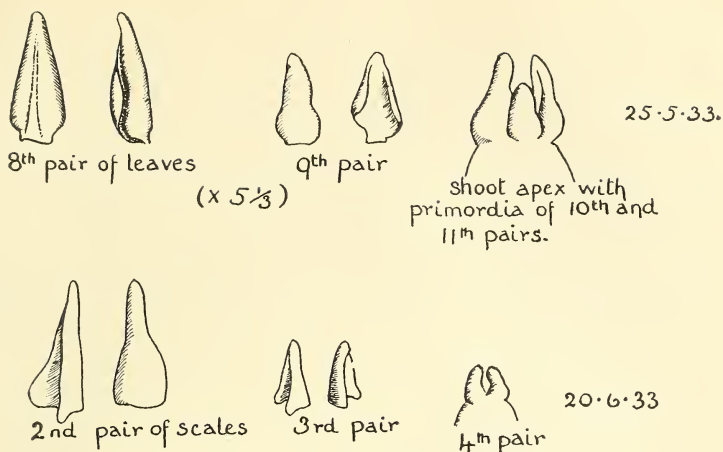


FIG. 1.—Lilac.

Some of the pairs of leaves from dissections of buds on 25/5/33, when leaf primordia were forming at the apex and on 20/6/33, when scales were forming.

(In all figures when no magnification is stated, the drawings were made from observations through the microscope. The magnification in these cases is considerably greater.)

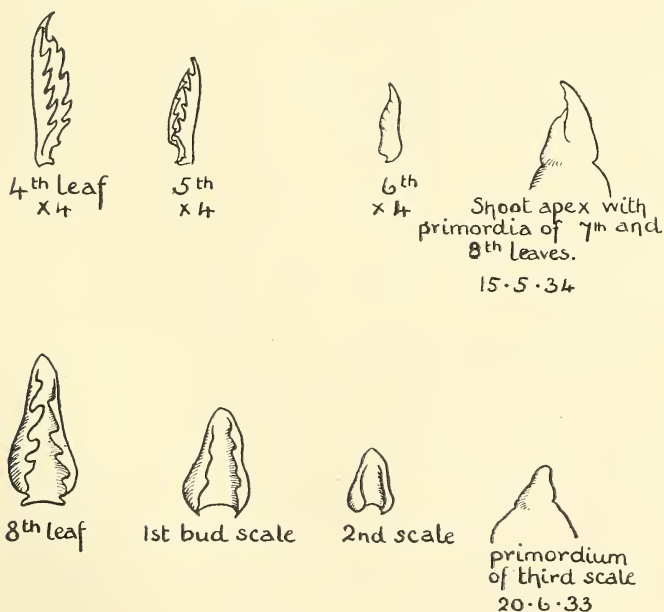


FIG. 2.—Holly.

Leaves from a dissection on 15/5/34, when leaf primordia were forming, for comparison with those from a similar dissection on 20/6/33, when scales were forming.

vein system in the leaf primordium, the lamina may soon show a tendency to become lobed and in holly the spines characteristic of adult leaves may soon be recognised whilst the scale margin remains quite simple (Fig. 2).

In ash, the young primordia soon become surmounted by the finger-like lobes of the developing lamina. In buds dissected in May or early June, when the scale primordia have only recently been formed, similar lobes are clearly seen at the apex of the young scales, so that in the early stages the primordia of the two types are extremely alike (Fig. 3). During further development however, the lamina lobes on the true scales fail to progress further and are usually difficult to observe on adult scales. The transitionals may show all stages between leaves with fully developed lamina leaflets and the typical scales.

In cherry also beautiful examples of transitionals may be found and in dissections in June, when the scales are forming, it is seen that in early stages of development the lamina is also present on the primordia of the true scales (Fig. 4). This may be sufficiently developed to show even indications of a slight marginal toothing but, as in ash, the lamina on the true scales becomes dried out at an early stage and is usually not seen at all on adult scales or only as a minute dry point between the teeth which represent the stipules.

In most of the types during the period of transition from the formation of scale primordia to those of leaves or *vice-versa*, structures of intermediate form are frequently developed and these are always characterised by better development of the lamina than in the scales proper and a more marked vein system. If scale development is determined by the scarcity of water and food materials moving into the growing point at the time of their development, it is not surprising to find the vascular system of bud scales little developed and this is very naturally associated with the differences in form which are usually observed.

THE INTERPRETATION OF THE BUD SCALE IN *Castanea*

In the winter buds of *Castanea pumila* (L) Mill., Foster ⁽¹⁾ observed that the stipulate foliage leaves follow a pair of 'opposite' unsegmented scales. On the grounds that an axillary bud is associated with each of these two scales, Foster concludes that each is a separate foliar organ and not a single stipule and concludes that 'it seems probable that the bud scales in *Castanea* have arisen from leaf primordia, which failed to segment into leaf blade and stipules.' In *Castanea dentata* (Marsh) Borkh., Foster also observed that the first two appendages of the developing shoots were scale-like structures, each with a bud in its axil.

In the present observations, many buds of *Castanea*

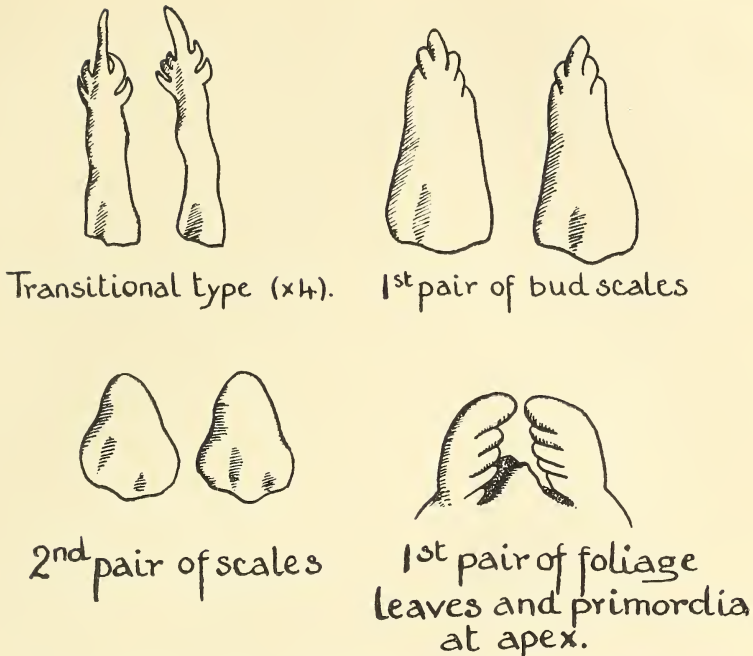


FIG. 3.—Ash.

Pairs of scale primordia from a dissection on 5/6/33. The young scales show leaf-like lobes at the apex.

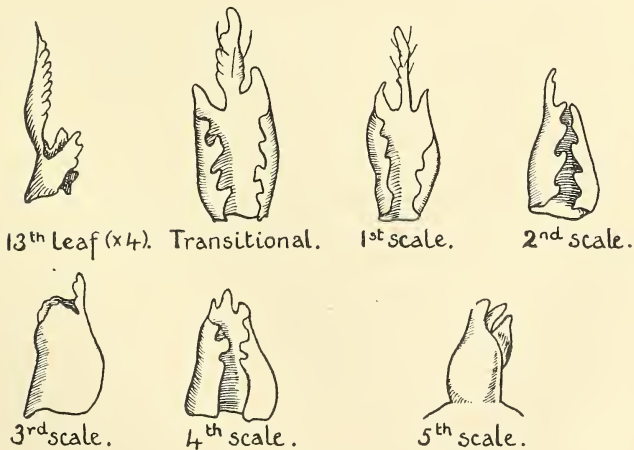
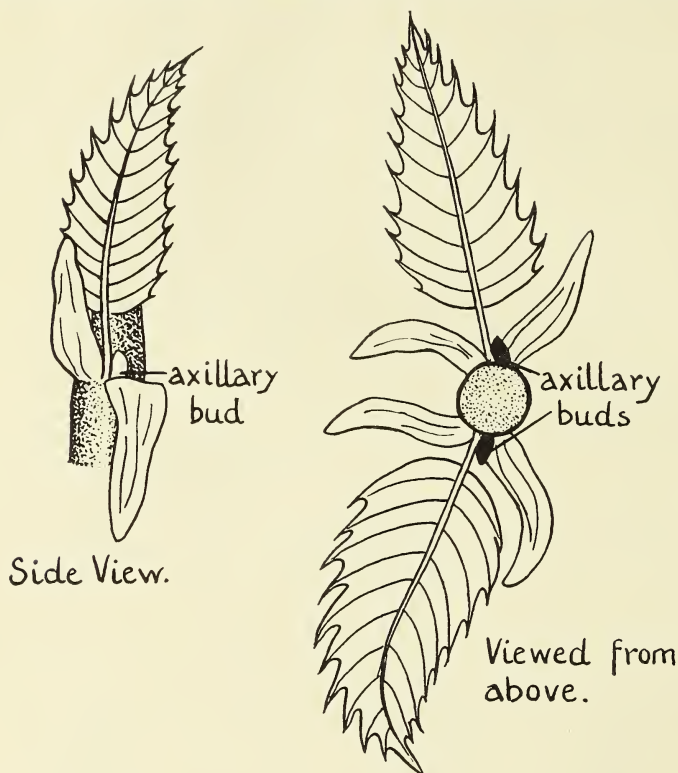


FIG. 4.—Cherry.

Leaves and scale primordia from a dissection on 20/6/33. The young scales have an abortive lamina at the apex of the stipulate leaf base.

vulgaris Lam (*sativa* Mill) have been examined and it appears that buds in the axils of the two scales are not so frequent as in the species examined by Foster and in no case has a bud been seen in the axils of both the scales. A number of extending shoots were also examined and in the majority of cases,



Diagrams showing positions of axillary buds in *Castanea*.

FIG. 5.—*Castanea*.

Diagrams to show the position of axillary buds.

the axillary bud was somewhat to one side of the median line of the petiole of the leaf (Fig. 5). Since the stipules wrap round the petiole base to some extent, it is clear that should the lamina region of the leaf fail to develop, as appears to be the case in the formation of bud scales, then the bud would appear to have formed in the axil of the stipule. In this species there is a gradual transition from the brown, brittle,

outer scales to the green, typical stipules and as one dissects the outer structures from the bud, there is a gradual increase in the size of the foliage leaf between the stipules. On the other hand there is no indication of structures which could be regarded as transitional between the outermost pair of scales, regarded as 'unsegmented primordia' and the pairs of scale-like stipules with a foliage leaf between them, which follow directly after the outermost pair of scales. These facts suggest that Foster's interpretation of the scales in *C. pumila* are not applicable to this species where each outer scale appears to be equivalent to a single stipule.

THE CYCLE OF GROWTH IN RELATION TO NATURAL DIE-BACK.

In the horse chestnut and ash type, the leaves to expand during the season are all present in the resting bud and as soon as extension is initiated, this process is soon completed. This is followed by leaf formation and the buds pass into the resting condition relatively early. Such buds might be described as 'mature' and are able to withstand the dry conditions of the tree in late summer so that the terminal bud persists and the type of growth of such trees is typically monopodial.

In types such as privet and lilac on the other hand, vigorous leaf formation proceeds in the spring and all these and their associated internodes normally extend in the current season, so that the period of extension is likely to be long continued. The apex of the shoot is thus late in ceasing growth and forming the terminal bud and similarly the buds in the axils of the distal leaves. The water content of the tree is usually very low at this time and commonly such immature parts are unable to complete their growth and simply dry out and die back to a part where the axillary buds are more mature. Such dead tips to the shoots are common in lilac and privet (Fig. 6) and result in sympodial branching.

The other three types examined cherry, holly and sweet chestnut are intermediate between the two groups considered. Leaf development is resumed in the spring, but the number of leaves produced at this time is much fewer and the monopodial habit of branching suggests that the terminal bud is usually



FIG. 6.—Privet.
A shoot which has
died back nine in-
ternodes to the first
pair of lateral buds
with scales.

sufficiently mature to withstand the dry conditions in late summer.

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HOUSE SPARROWS AND APHIDES

H. B. BOOTH, M.B.O.U.

HOUSE sparrows are almost universally disliked; one writer even going so far as to denounce them as 'avian rats,' and with good reason in many cases. The keeper of domestic poultry or pigeons has to pay his full tithe to them, and the grower of corn is much more to be pitied. Even the gardener is not free from their attentions, especially when his yellow crocuses are in flower. But the house sparrow is really the 'John Bull' of the bird world, and is prepared to hold his own wherever man can 'stick it.' On the other hand the sparrows do a considerable amount of good while their young are in the nest by destroying large numbers of insects, caterpillars and grubs detrimental to vegetation.

But the object of this short note is to draw attention to the period when their young are newly hatched. In May the old birds will be seen diligently searching the undersides of the newly-opening leaves of the sycamore and other large-leaved trees and collecting numbers of what I take to be a large-winged yellow aphid. As soon as the second brood is hatched the parents busy themselves in collecting aphides from various bushes and plants, and several times I have seen them taking them from the garden rose.

Hitherto, and until the Y.N.U. excursion to Goole in August, 1934, I had not noticed this habit in connection with the hatching of the third brood. But standing on the river bank on 6th August I was much interested by the numbers of house sparrows in a fringe of reeds by the river side and also with the numbers that were making the unbroken journey between the village of Ousefleet and these reeds and back again. As these journeys were over two hundred yards of fast ripening corn, it must have been very tantalising to the sparrows, but they withstood the temptation bravely. My botanist friends, who were better equipped to search amongst the tall reeds in the rain than I was, assured me that the stalks of the reeds were covered with a species of aphid which the sparrows were noisily gathering.

MARINE RECORDS AND NOTES FROM SCARBOROUGH

W. J. CLARKE, F.Z.S.

GREY SEAL IN YORKSHIRE

AMONG the attractions for visitors exhibited this summer on the West Pier at Scarborough is 'Bonzo, the largest seal in England.'

I have visited many such shows in the hope of finding something good, and have generally been disappointed, so I paid my twopence for admission without enthusiasm, expecting to find a Common Seal. I was delighted therefore to see a very fine male example of the Grey Seal (*Halichoerus grypus*) in excellent condition.

Bonzo measures about $7\frac{1}{2}$ feet in length, is stoutly built, and a very powerful animal. He was caught as a pup on Filey Brigg in February, 1927, and measured 3 feet at the time of his capture. His long cone-shaped head with its flat profile exhibits very clearly the great difference between the head of this species, and the round bullet head of the Common Seal, with its comparatively high forehead. As he floats in his concrete tank he also frequently shows the curious habit of the Grey Seal of curving the body upwards so that the head and the hind feet are the only parts to be seen above water. His colour when wet is a very dark grey—so dark that it appears black—with a few irregularly shaped patches of lighter grey, of no great size, on the sides of the hinder part of the body. When I told his owner that he was a Grey Seal, I was immediately met with the rejoinder, 'How can it be a grey seal when it's black?'

The Grey Seal is a very rare animal on the East Coast of England, and I know only of one other occurrence on the coast of Yorkshire—an example measuring 7 feet in length which was killed at Saltwick Bay, just south of Whitby, on August 30th, 1913, by T. Roberts. It was exhibited for several days in Messrs. Turner's warehouse in Whitby, and was afterwards preserved, but I do not know where it is at present. The species is not included in the *Handbook of Yorkshire Vertebrata*, published in 1881.

The Grey Seal is the rarest of the British species, and is not really abundant anywhere. Restricted to the North Atlantic shores, it is probably commoner on the Western Irish coasts than elsewhere. It also occurs on the Western islands of the Scottish coast, being found usually in isolated pairs. It occurs in Iceland, Scandinavia and Greenland, and on the American shores it inhabits the Nova Scotian coast as far south as Sable Island. The Grey Seal is also the largest native species, full-grown males reaching 8 to 9 feet in length.

Sir Harry Johnston records one of 'nearly 11 feet.' Females are smaller.

LARGE SOLE AT SCARBOROUGH

A COMMON SOLE (*Solea vulgaris*) of unusual size was caught by the motor boat *Treasure* while fishing a few miles off the Castle Hill on August 16th, 1935. The fish measured 22 inches long by $9\frac{1}{4}$ inches wide. It was not weighed.

Although a large specimen of its kind, this is not the biggest which has been caught near here. On April 14th, 1913, an example was trawled near Flamborough Head which was 23 inches long, $11\frac{1}{2}$ inches broad, and $2\frac{1}{2}$ inches thick. This fish weighed $5\frac{1}{2}$ lbs.

Yarrell, in his book on British Fishes, records a specimen 26 inches long, $11\frac{1}{2}$ inches wide, and weighing 9 lbs. A sole weighing 2 lb. is considered a large one.

THIN-LIPPED GREY MULLET AT FILEY

ON July 11th, 1935, a fish unknown to its captors was caught in the salmon nets in Filey Bay by Mr. J. W. Johnson, who sent it on to me. It proved to be an example of the Thin-lipped Grey Mullet (*Mugil capito*). It measured $17\frac{1}{2}$ inches in length and weighed 2 lbs. Grey Mulletts are not common in Yorkshire waters, and in most cases when they have occurred the exact species has not been ascertained. The three British species are much alike and great confusion has existed in the past owing to this resemblance. They are chiefly found off our southern and western coasts where they are sometimes very abundant.

DOUBTFUL RECORDS OF RARE FISHES AT SCARBOROUGH

ON May 15th, 1935, a strange fish, said to be a Parrot Wrasse, was landed by the s.t. *Eccleshill* and was sent for exhibition to the Doncaster Co-operative Society. Its length was said to be about 24 inches. No specimen of any of the Parrot Wrasses, which with the exception of a single Mediterranean species are inhabitants of the tropical parts of the Atlantic, have been recognised in British waters, and the identification of this specimen was thoroughly unreliable. It was named by a fish packer on the pier who had a picture in a book which 'looked exactly the same.'

A Rabbit Fish (*Chimaera monstrosa*) which is at present being exhibited in Scarborough as having been caught by a local trawler, was sent here from Grimsby, and may have been caught anywhere in the North Atlantic. There is, so far as I know, no Yorkshire record for this curious species which is of very rare occurrence in the North Sea.

RECORDS

ROLLER (CORACIAS GARRULUS GARRULUS L.) IN
NORTHUMBERLAND

In the August number of *The Vasculum* (p. 113) Mr. G. W. Temperley records that a female Roller was picked up in a dying state on 3rd June on Snabdough, near Tarsset. It is now in the Hancock Museum, Newcastle-on-Tyne.

FULMAR PETREL NESTING ON THE FARNE ISLANDS, ETC.

Our Yorkshire readers in particular should be interested to know the Fulmar Petrel has definitely bred this year on the Farne Islands. Although the birds breed fairly numerously on the mainland and have been visiting the islands and sitting about for several years, this is the first season that either an egg has been seen or the young have hatched. On the Inner Farne the watcher reported a pair of Lesser Terns, and he thought they were breeding. Although I sat for over an hour I saw only one Lesser Tern, and did not see any land on the shingle.—F. H. EDMONDSON, Keighley.

THE CLOUDED YELLOW (COLIAS EDUSA FAB.) IN WEST
YORKSHIRE, V.C.64

On Saturday, 24th August, a young entomologist, Mr. Brian Leuty, caught a fresh specimen of *Colias edusa* Fab. on Austwick Moss. This year the immigrant butterflies were not seen at the normal early dates, even at well-known North British localities like Grange-over-Sands; it was not until 21st August that the Red Admiral and Painted Lady were seen there and two specimens of the Clouded Yellow were noted. In 1933 the latter species was seen on the Humber shore, and in Porritt's *Yorkshire Lepidoptera* the years 1877, 1900 are mentioned as times when it was seen fairly frequently in Yorkshire, and in the Union's Annual Report and *Naturalist* in 1922 there was a further occurrence recorded.—CHRIS. A. CHEETHAM.

SWEDISH BLACK-HEADED GULL RECOVERED IN THE WEST
RIDING

DURING the last week of May, 1935, a dead Black-headed Gull was picked up near the gullery on Pinhaw, near Crosshills, bearing a ring marked Gothenburg Museum, Sweden, C28744. The discovery was reported to the Museum and Professor Dr. L. A. Jagerskiöld has written stating that this Black-headed Gull *Larus ridibundus*, Linne, was ring-marked as a young bird at the breeding ground on the Island of Öland, in the Baltic, on June 16th, 1934.—W. W. HOLGATE, EARBY.

YORKSHIRE NATURALISTS AT LANGSETT

FROM letters to newspapers and reports of protest meetings it would appear that a great many people were anxious to have access to the moors between Sheffield and Manchester but on July 6th when permission was obtained from Sir T. E. M. Pilkington and from the Sheffield Corporation to visit this area only two or three came from Sheffield and only some twenty from the rest of the county. Those who did make use of the opportunity were well repaid by the weather and the fine country. Some interesting evidences of landslips were seen on the stream which drains the western end of Midhope Moor on a scale that made the non-geologists sceptical when they were pointed out.

Mr. W. S. BISAT writes: A great deal of information about the geology of the Langsett area is contained in the *Geological Survey Memoir* on the country around Holmfirth and Glossop, published in 1933. From this memoir we learn that the marine band above the Rough Rock, on the horizon of the Pot Clay coal is well exposed in the Little Don about half a mile below Langsett, and is rich in fossils. One of the lower marine bands, containing the γ mutation of *R. reticulatum* was seen at Hingcliff Scar on the Little Don, about one and a half miles west of Langsett. Also *Carbonicola* occurs about 24 feet below the base of the Rough Rock in a shale cliff alongside Midhope Reservoir, this being one of the lowest records for this genus. An *Anthrecomya* band occurs about 50-70 feet above the Hard Bed Coal.

It is on Midhope Moors south of Langsett that the Rivelin Grit changes from its fine-grained northern character to a coarse, pebbly grit. In the Ewden valley the grit is succeeded by a marine band with the β mutation of *R. reticulatum*. It would appear from the Memoir that the finer-grained grit to the north is succeeded by the later β mutation, so that it is a question for further research whether the fine-grained and coarse-grained Rivelin Grits are on precisely the same horizon.

Lepidoptera Report: Mr. M. D. BARNES writes: Quite a large number of lepidoptera were observed, although no one was actually engaged in the study of the order. I am indebted to Mr. W. E. L. Wattam for several additions to the list made by myself and I am incorporating them in the list.

BUTTERFLIES.

**Aglais urticae* (larvæ)
Pieris rapæ

Pieris napi
Chortobius pamphilus

MOTHS.

Lasiocampa quercus (v. *callunæ*)
**Saturnia pavonia*—minor (larvæ)
Arctia fuliginosa
Xylophasia monoglypha
Hadena dentina
H. psi
Charæas graminis
Anarta myrtilli
Triphæna pronuba

Acidalia fumata
Ematurga atomaria
Larentia didymata
L. cæsiata
Hypsipetes elutata (larvæ)
Tortrix viburnana
Bactra lanceolana
Hepialus velleda var. *gallicus*
H. humuli

Coleoptera Report: Mr. M. D. BARNES: Although the weather experienced at the Y.N.U. meet in the Little Don Valley was very pleasant, the number of coleoptera met with was very disappointing indeed.

One very interesting feature of the ramble, however, was the large number of *Coccinella 7-punctata* (the Seven-spot Lady-bird). They were

to be found everywhere and in all stages of development from the egg to the perfect insect. Judging from my own observations and reports I have had from other naturalists, this insect appears to be very common in most parts of S.W. Yorkshire and probably in many other parts of the county.

The complete list of beetles taken on the excursion is as follows :

Notiophilus biguttatus (Fab.)
Nebria glylhenhali (Sch.)
Anchomenus ruficornis (Goez.)
Bembidion ustulatum (Lin.)
Aphodius lapponum (Gyll.)
Athous hirtus (Hbst.)
Adrastus nitridulus (Marsh)
Corymbites pectinicornis (Lin.)
Necrophorus mortuorum (Fab.)
Coccinella 7-punctata (Lin.)
C. bipunctata (Lin.)
Halyzia 14-punctata (Lin.)

Diptera : CHRIS. A. CHEETHAM : In the dark places by the stream and rills the white tarsi of *Dolichocheza sylvicola* Curt. were often seen ; the insect was fairly common. In damp spots among rushes, etc. the well-marked *Pedicia rivosa* L. occurred occasionally. The only Tipulid at all frequent was on the higher parts where *Tipula alpium* Bergr. was to be caught, other Tipulids were *T. cava* Rdl., *T. oleracea* Linn., *T. scripta* Mg., *Pachyrrhina histrio* F. Limnobiids were scarce, the only species noted being *Limnobia nubeculosa* Mg., *Limnophila lineola* Mg. and *L. nemoralis* Mg. Two species of Leptids *Leptis scolopacea* L., *L. lineola* F. and the striking *Protocalliphora grælandica* Ztt. (*Phormia cærulea* R.D.) complete the list.

Botany and Plant Ecology : (W. E. L. WATTAM) : The valley of the Little Don (or Porter as the Ordnance map alternatively gives it) was strictly followed. This valley, by no means wide, was examined for about one-and-three-quarter miles. In general the river is confined to a channel carved in the rough rocks of the Millstone grit and in places where resistance has been less great flood areas provide large pools. For one-and-a-half miles the embankments on each side are very steep and display a striking contrast in their vegetation. On the right side (working upstream) where the slopes drop sheer to the stream, the ground vegetation is an almost unbroken sweep of Bracken with *Deschampsia*. At the extreme commencement of this side of the valley the Bracken is to some extent kept in check by mowing and dwarfed beds of Bilberry and *Festuca ovina* L., with *Potentilla*, are the chief plants. Occasional trees of Scots Pine, Sycamore, Alder and Mountain Ash occur, and it was particularly noticeable how well established were seedlings of the Sycamore, Mountain Ash and Ash. It is, however, the whole length of the escarpment on the left side of the valley (working upstream) that particularly attracts attention, for here, though Bracken intermingles right to the ridge top, it is quite a subsidiary plant to the other ferns which here occur. At first for a considerable distance the wealth and beauty of *Lastrea Filix-mas* dominates, huge plants with fronds three feet in length emerging from raised stools of decayed growths a foot in height, and in relief are numberless examples of the lighter tinted *Lastrea oreopteris* with pleasing scent, whilst recesses are denized by *Blechnum boreale*. Then follows a break in the nature of the flora on this escarpment for about three-quarters of a mile, and here *Deschampsia*, *Nardus*, *Agrostis*, *Calluna*, Bilberry, *Erica cinerea* L., *E. tetralix* L., *Hypericum humifusum* L., *Potentilla*, and *Galium saxatile* L. give a pleasing display. Within the remainder of the distance traversed (to the small woodland

belt) two streams join the Little Don, and once again the deep carved channels are dominated by ferns with a change over to *Athyrium filix-femina* as the dominant, *Lastrea filix-mas* and *L. oreopteris* being in much less numbers and but little Bracken. Noticeable in this woodland belt are two well grown trees of Horse-chestnut, a single Mountain Elm, several Oaks (both pedunculata and sessiliflora), Birch, Ash and Hawthorn, the dominants being Scots Pine, Larch, Sycamore and Mountain Ash, the young trees of the latter displaying masses of immature fruit, while the older trees, especially those on the summit ridge, were in many cases fast decaying. The swamp areas throughout displayed a generous growth of Sphagnum and Polytrichum and dense forests of *Juncus effusus* L. Here also were *Ranunculus Flammula* L., *R. Lenormandi* Schultz, *Myosotis palustris* With., *Cardamine amara* L., *Galium uliginosum* L., *Prunella vulgaris* L., Foxglove, Marsh Thistle, *Hydrocotyle vulgaris* L., *Narthecium ossifragum* Huds., *Juncus bufonius* L., *J. uliginosus* Sibth., *Carex flava* L., and *C. pulicaris* L.

Lichens : (W. E. L. WATTAM) : The majority of the species which I listed at the Penistone Meeting in 1923, and reported in *The Naturalist* for that year, p. 343, as occurring in the conjunctive valley to the left of the true valley of the Little Don, were again observed. The foliose species of *Parmelia* are scarce and only occur on the rock outcrops, none whatever on tree boles, whose sole occupant is *Lecanora conizæa* Ach. Additions to the list already published are *Cladina sylvatica* Hoffm., in small patches, *Cladonia gracilis* Willd., *C. cervicornis* Schaer., *C. coccifera* Willd., *F. phyllocoma* and *C. flabelliformis* Wain.

Bryology : W. H. BURRELL : The ground traversed adjoined Midhope Moor which was visited in July, 1923 ; there was the same profusion of *Orthodontium* on the peat, *Catharinea crispa* in the stream-side silt, and with few exceptions the species seen were the same as reported in *The Naturalist*, 1923, p. 342, the only additions at Harden Moor being *Seligeria recurvata*, *Ditrichum homomallum*, *Fissidens bryoides*, *Philonotis fontana*, *Webera carnea*, *Aplozia sphaerocarpa*, *Dicranella rufescens* and *Discelium nudum* ; the two last had been seen in the district previously on the exposed bed of Langsett Reservoir.

Members had the rare opportunity of seeing the male plant of *Discelium nudum* in optimum condition. It is one of the smallest bryophytes, less than the fiftieth part of an inch in diameter—the head of an ordinary pin would support five plants—but under the favourable light conditions the shale slopes were repeatedly seen to be tinged with their ruddy colour. Associated with it in similar profusion were the males of *Dicranella rufescens*, the two minute species being quite different in habit, though each contributed to the colouration of the shale ; the *Dicranella* had longish pointed bracts, converging so as to completely enclose and hide the antheridia which were only visible as a dark mass through the bracts, as the fruits of Goatsbeard are enclosed by the involucre ; in *Discelium* the bracts were short, obtuse, more or less erect or spreading, forming an open inflorescence—comparable with the fruiting capitulum of nipplewort—within which the egg-shaped, reddish antheridia could be seen ; it was these open inflorescences that attracted attention. In *The Journal of Botany* 59 : (1921) p. 134, Mr. Dixon cited a case in which 'the very minute stems of *Discelium nudum* were remarkable for the dense agglomeration of antheridia they contained, giving the capitula a quite distinct reddish colour when viewed with a lens. This would appear to be abnormal as Wilson and Limpricht described male flowers as bearing few antheridia.' In the present case ten was the greatest number of antheridia seen in a single inflorescence. Not only did members see them with a lens, but the plants were so numerous as to visibly colour the shale slopes.

LICHENS OF INGLETON AND DISTRICT

W. WATSON, D.SC., A.L.S.

IN 1873 John Windsor, in his *Flora Cravoniensis*, gave a number of lichens which had been found in the Ingleton district. Many of these were due to the field work of Dr. B. Carrington, of Yeadon, who, in the course of his tramps through the lovely scenery of the district, collected a large number of the lichens to be found there. In the *Flora of West Yorkshire* (1888) Dr. F. Arnold Lees incorporated the work of these two pioneers with that of other collectors such as W. Brunton, J. G. Baker, W. T. Bull, J. Dalton, S. Hailstone, R. Richardson, J. E. Smith, R. Teesdale and W. West. In 1925 D. A. Jones dealt with 'The Lichen Flora of the Ingleton District' in this journal, and gave a general account of its richness in lichens, especially on its wonderful limestone pavements. In 1934 Mr. Jones revisited the district in my company, and on several occasions we devoted ourselves to a special investigation of the lichens.

It does not seem necessary to repeat Mr. Jones' remarks on the diversity of the geological strata which contribute so largely to the richness in lichens, or to reiterate in the following list those which he found abundant in 1925. Most of those which he saw in 1925 were again noticed in 1934 when we worked the district together. On two of our excursions we got out of the Ingleton district in a strict sense. On one occasion we got as far as Botton Mill in the Hindburndale district of North Lancashire (V.C. 60), and on another to Bolton Woods, which, however, are in the same botanical vice-county (64) as Ingleton. When the lichens found on these two occasions are of sufficient interest they are included in the list. The arrangement and nomenclature follows that advocated in my 'Classification of Lichens,' *New Phytologist*, XXVIII, 2 and 3 (1929). New vice-county records are indicated by asterisks.

The following abbreviations are used for localities:—

C.=Clapdale. Hind.=Hindburndale.
H.=Above Horton-in-Ribblesdale on the way to Pen y Ghent.
I.=Ingleton. Bolton W.=Bolton Woods.

Evernia prunastri Ach., I., H. and C. The usual form was f. *sorediifera* Ach., but the rare f. *retusa* Cromb. was noticed on a tree near Beezley Farm (64*).

E. furfuracea f. *scobicina* Cromb., I. and H.; f. *ceratea* Cromb., H. and I. (64*).

Parmelia sulcata Tayl., I. and H., Hind.

P. scortea Ach., limestone rocks above H.

P. saxatilis var. *panniformis* f. *cæsiopruinosa* Harm., H. (64*).

P. fuliginosa f. *aterrima* Wedd., H. (*); var. *glabratula* (Lamy.) Oliv., H. (64*).

- Hypogymnia physodes* (L.) Wats. and its form *labrosa* Ach. were frequent in all the localities visited.
- Cetraria aculeata* f. *edentula* Ach., Ingleborough (64*).
- Lecanora subfusca* Ach., I. and Botton Mill.
- L. chlarona* Nyl., I., Hind. (60*).
- L. sordida* Th. Fr., H.
- L. umbrina* Mass., Ingleborough (64*).
- L. crenulata* Hook., I. and H. This is not a new vice-county record as I had previously found it at South Milford.
- L. badia* (Pers.) Ach. and var. *cinerascens* Nyl., H. (64*).
- L. sulphurea* Ach., I., H. and Hind.
- L. polytropa* Schaer. and f. *efflorescens* Cromb. (60*, 64*), Ingleborough, H. and Hind.; f. *subglobosa* Cromb., I. (64*).
- L. expallens* Ach., Hind. (60*).
- L. conizæoides* Cromb., C. (64*), Botton Mill, Hind. (60*) with f. *tenuis* (Erichsen).
- L. varia* Ach., Bolton W., H.
- L. effusa* Ach. (64*), and *L. symmictera* Nyl., on pales, H.
- Ochrolechia tartarea* var. *subtartarea* (Nyl.), I. (64*).
- Aspicilia calcarea* f. *nigrolimitata* Wats., H. (64*); var. *contorta* f. *monstrosa* (Lamy.), H. (64*).
- A. lacustris* Th. Fr., Hind. (60*), H., I.
- A. prevostii* Th. Fr. and f. *melanocarpa* (Kremp.), H. (64*).
- Psora lurida* D.C., I., H.
- P. ostreata* Hoff., Ingleborough Drive.
- Biatora coarctata* Th. Fr., I., H., Hind.; var. *glebulosa* (Sm.) Arn., H. (64*).
- B. granulosa* Lind., Tatham Fells.
- B. uliginosa* Fr., on peaty ground, H., I., Ingleborough; var. *fuliginea* Fr., Ingleborough Drive (64*).
- Lecidea goniophila* Schaer., H. (64*).
- L. restricta* Stirt., H. (64*). Previously only recorded from Scotland.
- L. tenebrica* Nyl., H., C. A specimen of this from Malham (*leg.* W. West) in the same vice-county (64) is in herb. Darbshire at Bristol University under the name of *L. lugubris*. It had previously been collected in the British Isles from Westmorland only.
- L. contigua* var. *flavicunda* Nyl., I. (64*); var. *platycarpa* Fr., Hind.
- L. percontigua* Nyl., on rocks near Greta Falls (64*).
- L. sorediata* Nyl., on rocks, H., I. (64*), Hind.
- L. crustulata* var. *meiospora* (Nyl.) Oliv., on rocks, I. (64*).
- L. albocærulescens* Ach. and *L. cinerascens* A. L. Sm., were present on rocks near Pecca Falls. Neither are new to V.C. 64. The former had been previously recorded by Carrington from Malham, whilst the latter was found by me near Buckden.
- L. jurana* Schaer. was found by Mr. Knight at Chapel-le-Dale (64).
- L. dicksonii* Ach., near Pecca Falls.
- L. parasema* Ach., I.
- Acarospora smaragdula* Krb., on wall above Ingleton Glens.
- Solenopsora candicans* (Dicks.) Zahl., H.
- Thalloidima cæruleonigricans* Th. Fr. and *T. candidum* Mass., H.
- Biatorina lenticularis* Krb., H., I.
- B. pilularis* Krb., on oak, I. Carrington's *Lecidea vernalis* recorded from Gordale and Bolton W. (Fl. Crav.) is probably this.
- Catillaria chalybeia* (Borr.) Mass., slopes of Ingleborough.
- Bacidia muscorum* Mudd., I.
- B. umbrina* B. and R., Hind.
- B. flavovirescens* Anzi., on the rocks near Pecca Falls (64*).
- Lecanactis abietina* Krb., Botton Mill (60*), Bolton W.
- Xanthoria parietina* var. *aureola* Th. Fr., I. (64*).

- Placodium murorum* var. *pusillum* Flag., H.
P. xantholytum Nyl., frequent on the limestone rocks, H., I.
Callopusia pyraceum (Ach.) Arn. and *C. rupestre* (Scop.) Wats., H.
C. ochraceum (Schaer.) Mass., H., I.
Candelariella vitellina f. *corusca* Ach., I.
Physcia virella (Ach.) Lynge and *P. lithotea* (Ach.) Nyl, H. The latter is new to V.C. 64, but the former had previously been found by me near Wetherby.
P. pulverulenta Nyl., I.
P. melops (Duf.) Nyl., near Pecca Falls (64*).
P. hispida Tuck. The var. *tenella* (Scop.) is much commoner than *P. leptalea* D.C. H., I.
P. caesia Nyl. and its variety *teretiusscula* Nyl. (64*), H., I.
Buellia colludens Tuck., on siliceous rock, Hind. (60*).
Rhizocarpon alboatrum var. *epipolium* A. L. Sm., H., I.
R. petræum Mass., H., I.; var. *excentricum* A. L. Sm., I.
Thelotrema lepadinum Ach. and var. *scutelliforme* Ach. (64*), Bolton W.
Phlyctis agelæa Krb., I (64*). Perhaps less common than *P. argena* Krb.
Cladonia pyxidata var. *pocilla* Fr., on limestone rocks and soil, H., I.; var. *chlorophæa* Flk., Bolton W., Hind.
C. fimbriata Fr., H., I., Hind.; var. *tubæformis* Malbr., Hind. (60*); var. *subulata* (L.) Wain., H., I. (64*), Hind.
C. ochrochlora Flk. and form *phyllostrota* Flk., Ingleborough.
C. cervicornis var. *subcervicornis* (Wain.). The common form on Ingleborough.
C. furcata var. *palamæa* Nyl., H., Ingleborough (64*).
C. squamosa Hoff., I., Bolton W.; var. *muricella* Wain., Bolton W.
C. rangiformis Hoff., I. Common on the slopes of Ingleborough.
C. luteoalba Wh. and Wils. On stony soil at summit of Ingleborough (64*), previously only recorded from Greygarth Fell, Patterdale, and Rannock.
C. coccifera Willd., H., I.; form *cornucopoides* Th. Fr., I.
C. flabelliformis Wain., I., Bolton W. (64*).
C. flærkeana Fr. Some plants referable to the type occurred on the higher slopes of Ingleborough, but most of the material was var. *carcata* f. *trachypoda* Nyl. (64*).
Gyalecta cupularis Schaer., H.
Petractis clausa Kremp. (= *G. exanthematica*), Ingleborough.
Cænogonium ebeneum A. L. Sm., H., I., Bolton W., Botton Mill (60*).
Crocynia finkii B. de Lesd., on limestone rocks, H. (64*).
Peltigera canina var. *membranacea* Nyl., I. (64*).
P. polydactyla var. *hymenina* Nyl. On the slopes of Ingleborough above Newby.
P. rufescens var. *lepidophora* Wain., C. (64*).
Peltidea aphthosa (L.) Ach., Ingleborough Drive, C.
Placynthium nigrum f. *corallinodes* Wain., C. (64*).
P. majus Harm., on limestone rocks, H. (64*).
Leptogium lacerum var. *pulvinatum* Krb., H.
L. turgidum Cromb., I.
L. schraderi Nyl., H., I.
L. tenuissimum Krb., I.
Collema granosum Schaer., I., C.; var. *auriculatum* A. L. Sm., I.
C. furvum Ach., H., C.
C. cristatum Hoff., H. (64*).
C. pulposum var. *pulposulum* Nyl., H. (64*).
C. cheileum Ach., I.
C. multifidum Schaer., H., I., C.; var. *jacobæifolium* Schaer., H.
Synechoblastus polycarpus D. T. and S., H., near Pecca Falls.
S. laureri Flot. This was recorded from Ingleton by Mr. H. H. Knight in this journal () as a new vice-county record. We

did not see it in 1934, but it was collected by Hebden and myself on the limestone pavement near Buckden in the same vice-county in 1919.

- S. rupestris* A. L. Sm. (= *Collema flaccidum* Ach.), I.
Thermutis compacta A. L. Sm. On damp rocks near Pecca Falls. As usual the material consists chiefly of the alga *Scytonema*, the fungal filaments being scanty and apothecia absent. (64*).
Arthonia radiata Ach., I. (64*); var. *swartziana* Sydow., I., Bolton W.
Opegrapha calcarea Turn. and *O. saxicola* Ach., H.
O. atra Pers., I., Bolton W.; form *parallela* Leight., I. (64*).
Graphis scripta Ach., I., Bolton W.; var. *pulverulenta* Ach., I. (64*).
Calicium hyperellum Ach., I.
Sphaerophorus melanocarpus Schaer., Bolton W.
Dermatocarpum miniatum Th. Fr., H., I.; var. *complicatum* Th. Fr., I.
D. aquaticum Zahl. and *D. lachneum* A. L. Sm., I.
Verrucaria aethiobola var. *submersum* (Schaer.) Wats., H. (64*).
V. viridula Ach. and *V. caerulea* D.C., I.
V. nigrescens Pers., H., I.
V. dufourii D.C., *V. muralis* Ach. (64*), and *V. rupestris* Schrad., H.
V. sphinctrina (Duf.) Nyl., on limestone rocks, H., I. This is the plant given previously as *V. calciseda*. The true *V. calciseda* D.C. as amended by Steiner, occurs on the slopes of Ingleborough (64*).
The segregate *V. parmigera* Stein. was found at H. (64*).
Thelidium immersum Mudd. Not uncommon above H.
T. pyrenophorum Mudd. On rocks near the upper part of the Greta (64*).
Staurothele hymenogonia Zahl., H. (64*).
S. rupifraga Arn., frequent on the limestone, H., I. (64*).
S. bacilligera Arn. On limestone rocks below the summit of Ingleborough. This has not been recorded previously from the British Isles. It differs from *S. rupifraga* in the rather smaller spores and the hymenial algæ are bacillar and not globose (64*).
Normandia pulchella Cromb. (64*). This was detected by Mr. D. A. Jones in material collected at Ingleton in 1925.
Arthopyrenia punctiformis Arn. (60*) and *A. epidermidis* Mudd., Hind.
A. fallax Arn., I. (64*). This is given as a new vice-county record, but Carrington's record of *A. analepta* Mass. may refer to it.
A. saxicola Mass. On rocks near the Greta (64*).
Acrocordia epipolæa A. L. Sm., Greta. I. C.
Porina chlorotica Wain., and var. *linearis* A. L. Sm. (64*).
Melanotheca gelatinosa Nyl. On hazel near Kingsdale Beck (64*).
Pyrenula nitida Ach. Rather rare, I.
Discothecium gemmiferum (Tayl.) Vouaux. A fungus parasitic on saxicolous lichens occurs at Ingleton.

REVIEWS AND BOOK NOTICES

The Glacial Geology of Holderness and the Vale of York, by **Sidney Melmore**, published by the Author, 4/-. In this small volume, Mr. Melmore has endeavoured to give a resumé of the Glacial Geology of the two areas mentioned in his title along with other districts adjoining. Most of the volume is a restatement of the views, with verbatim citations, of the older glaciologists, but in addition much of the author's own observations and speculations receive their first presentation. He offers a new explanation of the Knaresborough Gorge (figured as the George), namely, that it and many other so-called Glacial overflow channels are merely the results of ordinary stream erosion controlled by joint-directions. In this he will probably find few adherents to his views. Very useful is the attempt to offer a history of the changes in

level in Glacial times. A most annoying feature of the book is the unnecessary division into chapters, of which there are 31 for 89 pages. Chapter 25 consists of 28 lines of print, while of the 30 lines of Chapter 13 22 consist of the quotation from an earlier author. In the reviewer's opinion the quotations at the head of each chapter fulfil no useful purpose and the author could well have used the space in augmenting his correlation with other areas such as East Anglia. The book is illustrated by some extremely well-drawn maps and diagrams and misprints are few. The reader can get a good idea of the methods used in Glacial research in a country where the problems of Glacial Geology are still numerous.

List of British Vertebrates, pp. vi+66, British Museum (Natural History), 1/- . This useful list enumerates all living British vertebrates, giving their status and references to appropriate literature. Scientific nomenclature has been brought up to date and may be taken as authoritative.

Some Birds of the London Zoo, by F. Martin Duncan, pp. 114, with 26 coloured plates, 6/- . (John Bale, Sons & Danielsson, Ltd.) This book deals with a small but well-chosen selection of the birds to be found in the London Zoological Gardens. The author has selected those species which are most likely to be found in aviaries, or which, by reason of colour, etc., attract the visitors' attention. The habits, life histories and distribution of the chosen groups are very well described and should prove most helpful to the visitor to Regent's Park. The illustrations, which are reproduced from the author's own water-colour sketches, are really beautiful, and convey a better idea of the birds portrayed than any photograph could do. The printers also are to be congratulated on the care and accuracy of the colour printing.

The Birds of Midlothian, by J. Kirke Nash, pp. xxiv+303, with a map and 3 plates, 21/- . (Witherby.) This is a distinctly useful addition to British regional ornithological literature, but in some ways is rather disappointing. The author has devoted much valuable space to descriptions of species. This was hardly necessary in view of the great number of accurate and cheap manuals which may now be had. Accounts of distribution are very uneven in value and in the case of many species one feels that the book lacks a good deal of up-to-date information which must be available. The author, who, unfortunately, did not live to see the book through the press, had full access to the records of the late William Evans, the great Scottish naturalist, and there are many references to these in the text. The ten-page introduction is not the least valuable section of the work, which also includes a good map and three plates illustrating typical bird-haunts in Midlothian.

The Spiders and Allied Orders of the British Isles, by Theodore H. Savory, pp. xvi+176, with 63 figures in colour and 130 illustrations from drawings and photographs, also 61 diagrams in the text, 10/6. (Warne & Co.) This latest addition to the well-known 'Wayside and Woodland' Series is sure of an enthusiastic welcome from all British arachnologists and those who want to commence the study of this interesting but rather neglected branch of natural history. It would be difficult to imagine a better treatment of the subject than that adopted by Mr. Savory. Fifteen introductory pages are devoted to the essentials of structure, habits and life history, and methods of collection, preservation and study. Then follow a few pages devoted to a very clearly set-out classification. The rest of the book deals with the spiders, harvestmen, false-scorpions and mites to be found in Britain, and the clear descriptions of all species likely to be met with are supplemented by really excellent illustrations. The drawings of structural detail are as good as any we

have seen in any work on natural history, and the many coloured plates are a real help to identification.

Songs of the Birds, by **Walter Garstang**, pp. 140, Revised 3rd Edition, with a new chapter on the Classification of Birds and numerous illustrations by J. H. Shepherd. Published by John Lane in the 'Weekend Library.' 3/6. Northern naturalists will be pleased to see Professor Garstang's delightful book in its third edition. The author's interpretations of bird song are too well-known to need a detailed description. Some critics have objected to renderings such as 'Sip, sip, sip, see! Tee, tew, wee, tew! Witty, witty, wee-wee, weetew' (willow warbler) on the ground that a bird's vocal organs are incapable of rendering consonant sounds. Nevertheless we are of the opinion that, short of actual gramophone records of bird music, Professor Garstang's rhythmical lines are likely to help the beginner more than any other descriptions previously published. Our only regret is that all species have not been dealt with in this book. On the other hand it can be argued that when one has learnt a few songs with Dr. Garstang's help, the others will present no serious difficulty.

NEWS FROM THE MAGAZINES

The New Phytologist, Vol. 34, No. 3, for June contains papers dealing with the cambial activity and sucker shoot development of Poplar spp., by A. B. Brown; observations on the resistance to powdery mildews, by E. J. H. Corner; the utilisation of organic acids by *Aspergillus niger*, by T. A. Bennet-Clark and C. J. La Touche; the liberation of oogonia in certain Fucaceae, by E. Marion Delf; and the ovular apparatus of *Sphenopteridium* and *Diplopteridium*, by M. Benson.

The Entomologist's Monthly Magazine for August contains 'The British Tullbergiinae, Pt. I,' by R. S. Bagnall; '*Philonithus rectangulus* Sharp in Britain,' by C. E. Tottenham (recorded from Worcestershire, Warwickshire, Tewkesbury, Bagley Wood, and Sussex); 'A new British wasp, *Crossocerus exiguus* (van der Linden) (Hym., Sphecoidea),' by O. W. Richards (West Kent); 'A new species of the Dipterous family Phoridae,' by H. Schmitz (*Megaselia flavicans* Schmitz.); 'On the occurrence of *Megaselia flavicans* Schmitz. in Britain,' by J. E. Collin (Suffolk and Nottinghamshire); '*Conops* (*Leopoldius*) *signata* Wied. in Britain,' by C. J. Wainwright; 'A revised list of the British Siphonaptera,' by G. B. Thompson; 'Remarks on the name of *Boratomyia betulina* (Strom.) (= *Hemerobius nervosus* Fabr.) (Neur.) a reply to Mr. K. J. Morton,' by F. J. Killington and several short notes.

The Entomologist's Monthly Magazine for September contains 'Remarks on the Name of *Boratomyia betulina* (Strom.) (= *Hemerobius nervosus* Fabr.) (Neur.)—a Reply to Mr. R. J. Morton,' by F. J. Killington; 'Systematic Notes upon British Aquatic Coleoptera, Part VII, Ilybius and Copelatus,' by F. Balfour-Browne; 'New African Lycanidae (Lep. Rhop.),' by G. Talbot (with two plates); 'Obituary—Charles Ernest Stott'; 'The Parasites of British Birds and Mammals, IV, Records of Mammal Parasites,' by G. B. Thompson; and several short notes.

The Entomologist for September contains 'The variation of *Eucosma solandriana* L., *E. brunnichana* L. (= *sinuana* Schiffermuller and Hubner), and *E. piceana* Haw. (= *semifuscana* Stphs.) (Lep. Tortricidae),' by W. G. Sheldon; 'Notes on the Geographical Variations of *Argynnis aglaja* L.,' by R. Verity; 'Trichoptera, Plecoptera and Neuroptera, etc., in the Hautes-Pyrenees and the Haute-Garonne,' by M. E. Mosely; 'Migration Records, 1935,' by Capt. T. Dannreuther (*Nomophila noctuella* Schiff. at Grange-over-Sands); 'Where do "Red Admirals" go to in the Winter in England?' by H. W. Head; 'The Crabtree Collection,' by W. R. S. and numerous notes and observations.

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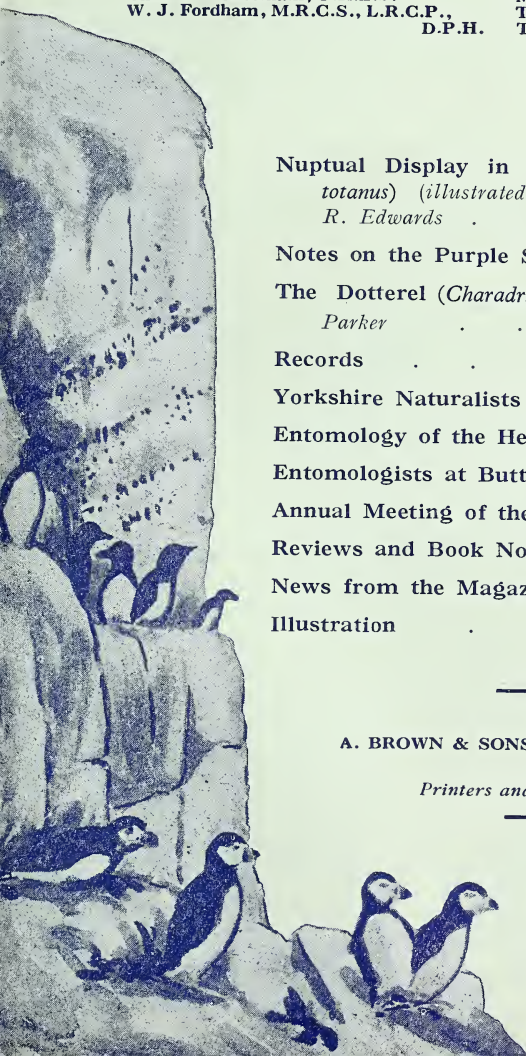
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NUPTIAL DISPLAY IN THE REDSHANK (*TRINGA T. TOTANUS*)

STUART SMITH AND GEORGE R. EDWARDS

(Illustrations by Geo. R. Edwards from his film of displaying Redshank)

As far as the British Isles are concerned, the redshank may be classified as a summer visitor, and as both an internal and a passage migrant. As soon as the young can fly the birds

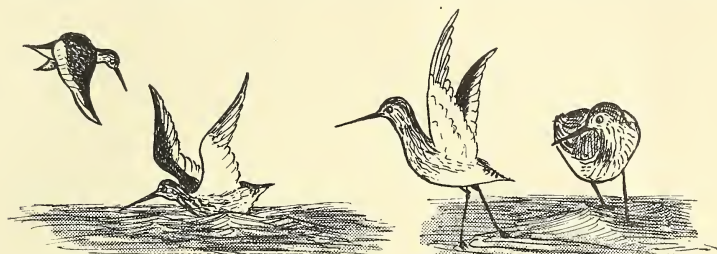


Fig. I

Fig. II

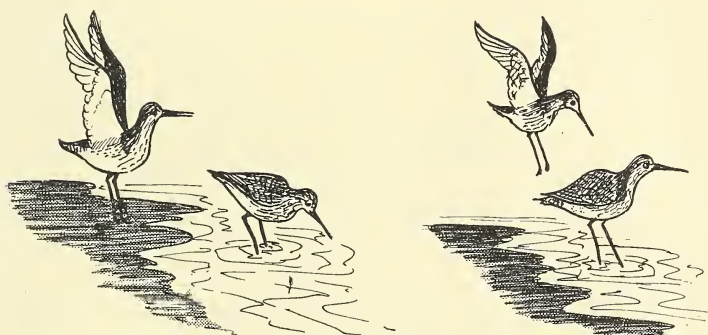


Fig. III

Fig. IV

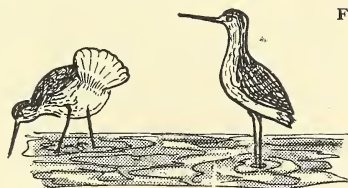


Fig. V

forsake their inland breeding haunts for the sea coast, whence they gradually work southwards as the winter approaches. At the same time there is a general influx of birds from Scandinavia and the Continent, and while many of these pass on, many, too, remain to winter on our coasts. Thus

although the redshank may be seen in coastal districts at all seasons of the year, it is a summer visitor to its inland breeding haunts. The return to these is usually made about the middle of March in the south, while April is usually here before the birds reach those in the north.

Immediately on arrival the male birds advertise their presence by the well-known 'yodelling' double call, and courtship display soon commences. Great competition appears to exist among the males for the possession of a female, and there are often as many as four of the former attending a single female. Display usually takes place at, or near, some feeding ground in the vicinity of the nesting haunts. The birds usually 'flight-in' to the pools in small groups of three or four, calling all the time. The notes are uttered rapidly in flight, but become slower and finally die away as the birds drop to earth. For about a minute after arrival, the birds stand motionless in well-separated groups, but soon several of the males begin to show signs of becoming restless and excited.

One commences to shiver its wings, slightly at first, but with gradually increasing vigour, and with wings vibrating, to run rapidly round one of the females, bowing and curtseying at the same time. The female appears quite indifferent to this display, and merely stands in a melancholy hunched-up attitude without moving. The displaying bird, however, soon galvanises the other males of the group into action, and one launches a violent attack upon it. Both birds rise momentarily into the air; a clash occurs; one is forced down into the water, and the winner follows up his advantage by diving onto the back of the other and ducking it under the surface (Fig. I).

During this scuffle, however, a remaining male takes advantage of the temporary absence of rivals to make overtures to the female. He takes up a position behind the female, and the same vibrating and raising of the wings occurs. The female looks round once or twice, but otherwise makes no recognition of the display (Fig. II). Before this can proceed very far, however, the victor from the first combat returns and makes a rush at the displaying bird with head lowered and feathers puffed out, and forces the latter bird to leap into the air to avoid the attack. Both then turn and commence to race together up and down before the female, their red legs moving so rapidly as to be indistinguishable to the eye. At the same time the rival males call loudly one again the other. After several more scuffles on the ground and clashes in the air, one male emerges triumphant over all others, and he proceeds to go through what is probably the complete display.

The female is approached from the front with a slow mincing gait, the male bird deliberately picking its way. The wings are then raised right above the back, and the head several times bowed until the beak touches the ground. Next the tips of the wings begin to tremble, which shivering motion is extended until the whole wings are shaking violently. In this way the gleaming white undersides are effectively displayed to the female (Fig. III). At the same time the male bird 'marks time' rapidly with its legs.

The displaying bird then rises into the air and hangs hovering over the female, calling loudly all the time. He then ceases to call, and descends towards her in short sliding movements, with red legs dangling and wings still shivering violently, and finally alights on the back of the female (Fig. IV).

If the time be opportune, coition then normally takes place; otherwise the female moves forward and the male flutters to the ground. Finally, he bows round the female with fanned tail (Fig. V), and the display is over.

NOTES ON THE PURPLE SANDPIPER

[*Calidris maritima maritima* (Brünn)]

F. SNOWDON

AMONG the many incidents of interest which the ornithologist whose lot is cast 'down by the sea' looks forward to in the autumn is the coming of that very charming little bird, the Purple Sandpiper, which is a regular autumn and winter visitor to the rock-bound portions of the Yorkshire seaboard, where it offers many opportunities of studying its œconomy. Owing to this bird keeping strictly to the coast it affords inland naturalists few opportunities of noting its habits. Formerly there appears to have been some confusion as to the status of this sandpiper, and it was then considered an irregular and uncertain visitant. So distinguished an observer as Cordeaux, who was thoroughly familiar with the birds of the coast, stated that he only once met with it in spring; and as Nelson, in fixing the date of its departure at that season goes back to the record of Cordeaux more than sixty years old, it is more than probable that he had not a later date on which to rely. In more recent times, however, close attention has been given to the manners of this bird during its stay on our coasts, and it has been established that it comes with the greatest regularity.

So far as local observation goes, the Purple Sandpiper does not usually reach the Whitby district until the latter part of

October, when odd birds or small parties are first noticed. As the season advances the number is gradually augmented until the month of December, when the maximum appears to be reached. During recent years the bird has increased very considerably on this part of the Yorkshire coast. Formerly only small parties were met with, but during the last ten years the number spending the winter with us is much larger, flocks of fifty or sixty being not unusual, while at times upwards of a hundred birds may be seen resting on the ledges of the East Pier, which is a favourite resort and practically their headquarters.

While it remains in this locality the Purple Sandpiper appears to find its surroundings thoroughly congenial. No matter how severe the winter may be the bird seems able to pick up a good living and to endure the severity of the season without discomfort. At low tide, when the bases of the piers are uncovered, the bird may be seen busily occupied among the seaweed attached to the lower portion of the pier, where it carries on an active search for food. Excursions to the rocky portions of the coast on both sides of the port are also made where the birds appear to obtain a good supply of food, a very favourite resort being a series of seaweed-covered rocks south-east of the harbour which are only uncovered at low tide. Here the birds may be found busily investigating every portion of the rocks where small marine creatures may be lurking. When the incoming tide covers this feeding ground the birds gather into flocks and fly to the ledges on the sides of the piers, where they rest and preen their plumage until the tide again goes out.

A bird of very exclusive habits with us, it mostly keeps apart from other waders, occasionally only being found to associate with flocks of Dunlin or Ringed Plover. Never by any chance do we meet with the bird on sandy beaches; nor, so far as our observation goes, does it ever enter the inner harbour or frequent the mud-flats in the upper harbour which are exposed at low tide, and which prove very attractive to other waders.

With the month of April the numbers of Purple Sandpipers gradually decrease, and as May advances there is a very appreciable diminution in the birds in their accustomed haunts, and by about the middle of the month the last one has usually departed.

This sandpiper is said to be found on the North-east Coast from August until June, but in our area, where the bird has been kept under close observation for many years, the earliest date on which it has been seen in autumn is September 19th, and the latest date for its stay in Spring, May 25th.

THE DOTTEREL (*Charadrius morinellus* L.)

T. HYDE-PARKER

THE inn of our little East Riding village, which, if unknown to history, at least figures in fiction, bears a sign that is probably unique. There is, at any rate, no mention of any other in the numerous books on English Inns which I have accumulated ; nor is it referred to in that singularly interesting work *The History of Signboards*. It is named The Dotterel, and must be familiar, at least by sight, to many visitors even beyond the bounds of Yorkshire. A reproduction of the sign may be seen in *Letters to Young Shooters*, by the late Sir Ralph Payne-Gallwey, who, by the way, had it repainted some forty years ago. This identical sign is yet on view, though now rather the worse for age and exposure.

The interesting and now sadly uncommon birds it depicts still visit us occasionally in spring, small parties—or ‘trips,’ to use the correct technical term—passing through on their way to their breeding quarters ; for they nest at a considerably greater altitude than is to be found anywhere in East Yorkshire. At one time they were much more plentiful, as witness not merely the sign of our inn, but various place-names in the district, such for instance as Dotterel Park, Dotterel Cot, etc. The enclosure of the Wolds, however, like the draining of the Fens, brought changes other than merely agricultural. The Great Bustard (who also left traces in local place-names), even then exceedingly scarce, disappeared for good ; the Stone Curlew, save for irregular and very occasional visits, soon followed suit ; while the Dotterel is now seen so seldom that years go by without a single specimen being recorded here, though in former days these birds came regularly and in considerable numbers, passing through much about the same date every season.

The name being apparently derived from the same root as *dotard*, *doddering*, and presumably the colloquial ‘dotty,’ one is scarcely surprised to find that the Dotterel is not a particularly intelligent bird. This, combined with a confidence in the human race as unusual as it was misplaced, must have accounted, in part at least, for the popularity of dotterel shooting in the past ! On the arrival of the birds, word used to be sent round, sometimes even by mounted messenger, and the local ‘sportsmen’ quickly assembled, blazing into the crown of them as they fed on the ground. As the survivors soon alight again after being shot at, whole trips were thus slaughtered. Unfortunately for themselves, they seem to have been always esteemed for the table. In the *Northumberland Household Book* (which, of course, relates to East Yorkshire, and was compiled about 1512), among the provision for ‘principal feastes’ is included ‘Item Dottrells to be

bought for my Lorde when they are in season, and to be at jd a pece.' When one adds that the plumage also was not only valued but marketable, for the making of artificial flies, it is will be realised that the Fates conspired against the unfortunate dotterel. No wonder it became less plentiful. When informed, as I very occasionally am, of their presence on some neighbouring farm, I 'stand not upon the order of my going,' for they are constantly on the move. One can, however, usually locate them without much difficulty, when, by careful stalking, it is often possible to watch the birds from within a few yards. Apart from this strange lack of caution, it used to be supposed that they were given to mimicking one's every movement, and, in so doing, became so fascinated as to be easily caught. Drayton refers to this belief in his *Polyolbion* :

'For as you creep, or cower, or lie, or stoop, or go,
So marking you with care the apish bird doth do.
And acting everything, doth never mark the net
Till he be in the snare, which man for him have set.'

The Dotterel—not to be confused with the so-called and much commoner Ring Dotterel—is a handsome fellow. Here, however, we must pause to remark on a rather unusual feature in this species : the female is reputed to be the more brightly coloured of the two, and certainly leaves most of the household drudgery to her husband—a fact which must have afforded considerable satisfaction to early pioneers in the feminist movement ! The nest, little more than a hollow scraped amidst lofty rocks, is to be found sparingly in parts of the Lake District, and in the Grampians and other Scottish mountains. An old keeper, whom Thomas Edward, the 'Scotch Naturalist,' consulted on the point, said 'on the grey slopes of the highest mountains, far above all other birds except the Ptarmigan.' When sitting, they display the same confidence, and, though endeavouring to entice the intruder away from their nest, will, if need be, return and sit in his very presence.

Breeding quarters are forsaken fairly early, and the return journey is usually taken in rather more leisurely fashion. Strange to say, they are not so often noticed winding their way southwards, possibly because the more or less definite routes followed on arrival here are not then so strictly adhered to. Nor do they at this season seem so gregarious as in spring, and thus may pass unnoticed or unrecognised until, joining forces, doubtless, with other returning migrants, they take wing for Northern Africa. There, amid warmth and sunshine, the winter months are spent, their 'counterfeit presentments' of the signboard being left to face the grey skies and bitter winds of our North-East Coast.

RECORDS

CHARA FRAGILIS (DESV.) VAR. HEDWIGII

ON the occasion of the B.E.C. meeting in Yorkshire a visit was paid to Castle Howard. Mrs. Macalister-Hall found the above Chara in very fine fruiting condition in the fish pond near the obelisk. The plant has been verified by Mr. Pearsall, who notes it as new in V.C. 62.

THREE NEW YORKSHIRE FOSSORS

MR. H. BRITTEN, of Whitby, has recently dug out various fossors from their burrows, and among these are three species new to the Yorkshire list.

Blepharipus walkeri Shuck. Goathland, 14-7-'35, in ash trunk. A male dug out of its burrow, preying on a dipteran with a greenish iridescence which is common on the moors. This is a rare species which usually preys on Ephemeriðæ. It occurs in the New Forest and has been taken in Perthshire, and also occurs in Ireland in sandy places.

Clytochrysus cavifrons Thoms. Hellwathbeck, 20-7-1935, in an alder trunk, preying on a syrphid. This species is widely distributed in the South of England, but does not appear to have been recorded from north of Nottinghamshire. It preys on Syrphidae, especially *Syrphus balteatus* and *corollæ*. It occurs in Ireland. It nests in rotten wood, commonly in plum trees, and there are two generations in fine summers. It is parasitised by *Eustalomyia hilaris*, *Ephialtes albicinctus* and a *Pteromalus*, and the burrows are visited by the phorid *Aphiochaeta rufipes* as a scavenger.

Cuphopterus signatus Panz. Hellwathbeck, 20-7-1935, a male in a decayed alder trunk. An uncommon species which occurs as far north as Scotland (Murroch Glen) (*E.M.M.*, 1904, p. 43). The next most northerly station is in Nottinghamshire. It preys principally on brachycerous diptera such as *Leptis*.

The above-mentioned insects have been identified by Mr. H. Britten, Senr., of the Manchester Museum.—W. J. FORDHAM, M.R.C.S., L.R.C.P., D.P.H.

PHILONTHUS RECTANGULUS SHARP, IN YORKSHIRE

Philonthus rectangulus Sharp, was added to the British list in August, 1935, by the Rev. C. E. Tottenham, on specimens from Worcestershire, Warwickshire, Gloucestershire, Berkshire and Sussex (*Ent. Mo. Mag.*, 1935, 174). It has occurred at Whitby, Yorkshire, to Mr. H. Britten (12/3/35, 15/3/35, 18/3/35, 29/4/35). Mr. Britten's captures occurred by riddling stable manure and the species was fairly plentiful, the sexes

being in about equal numbers. The insect resembles *Philonthus puella* Nordm., but is abundantly distinct, the square posterior angles of the head and the puncturation of the thorax rendering it easy of recognition. It was first described by Dr. Sharp from Japan and has subsequently been discovered in Europe and North America. Commr. J. J. Walker has taken the species at Oxford (*Ent. Mo. Mag.*, 1935, 183).—W. J. FORDHAM, M.R.C.S., L.R.C.P., D.P.H.

NEW YORKSHIRE SAWFLIES

AMONG some sawflies taken casually when sweeping for Coleoptera, by Mr. H. Britten of Whitby, are four species new to Yorkshire.

Empria (*Poecilostoma*) *tridens* Konow., Egton Bridge, 1/6/35; Sleights, 9/6/35; a widely distributed species recorded from Nottinghamshire, Lancashire and Cheshire, and Durham. It occurs in May and June.

Pachyprotasis simulans Kl., Mulgrave Woods, 10/6/35. A rare species distributed as far north as the Clyde and occurring in Cheshire. It has more white on the abdomen than the common *rapæ* and the larva has been taken on low growing ash.

Platycampus (*Leptocercus*) *duplex* Lep., Egton Bridge, 1/6/35. A local species occurring on larch from April to June. Recorded from Morpeth and Middleton-in-Teesdale, Durham.

Pteronidea ferruginea Fst., Hellwathbeck, 20/7/35. An early species usually occurring in April and May. It is recorded from Lancashire and occurs occasionally on Dartmoor, the larvæ being gregarious on sallow and doubtfully two brooded.—WM. J. FORDHAM, M.R.C.S., L.R.C.P., D.P.H.

RINGED BLACKBIRD

A FEMALE Blackbird was caught on Shipley Glen on July 17th with an aluminium ring on its leg, marked 279-A4-34. The ring was not taken off and the bird was released.

I sent the particulars to Mr. H. F. Witherby who replied that it was a private ring and he did not know anything of the ringer. If any reader can supply information we shall be pleased to have it, as it is evident the bird was ringed in 1934.—H. B. BOOTH.

COLEOPTERA NEAR WIGTON

IN *The Naturalist* for 1928-30 are several notes on the Coleoptera of this part of Cumberland. I have a number of species not included in these notes, the most interesting being the following:—*Hydroporus lepidus*, from peat holes on Oulton Moss. *Cercyon terminatus*, a pair from garden refuse at

Kelsick. *Philonthus fumigatus* (*immundus*), one, also from garden refuse. *Platystethus arenarius*, common. *Homalium concinnum*, Kelsick, several from a sparrow's nest. *H. cæsum*, rather rare. *H. rivulare* and *H. excavatum*, both common. *Anisotoma dubia* and *Olibrus æneus*, by sweeping on Oulton Moss in August. *Coccinella 11-punctata*, somewhat rare at Kelsick though common on the coast. *Scymnus testaceus* var. *scutellaris*, I took a specimen at Ireby on 5-6-25. *Melanophthalma fuscula*, common at Kelsick. *Cryptophagus affinis*, Kelsick. *C. pallidus*, one on a window in Wigton, 15-10-30. *Corymbites cupreus* var. *eruginosus*, one in the garden at Kelsick, 18-4-24. It is common about the summit of High Pike in June. *Cyphon punctipennis*, common on Oulton Moss. *Longitarsus atricillus*, Kelsick, common. *Barynotus elevatus*, one at Dundraw, 22-5-25.—JAS. MURRAY, Gretna.

EMPHYTUS ABDOMINALIS LE PELETIER IN YORKSHIRE
(HYMENOPTERA-TENTHREDINIDÆ)

In a recent paper (*Entom. Monthly Mag.*, October, 1935, p. 240) Mr. R. B. Benson has pointed out that two distinct species are included in Enslin's conception of *Emphytus serotinus* Müll. These differ widely in their feeding habits, typical *serotinus* being associated with the genus *Rosa*, whilst the other form, for which the author uses the name *abdominalis*, is attached to oak. In looking through our collection recently we were pleased to find three examples of the latter which we had tentatively identified as *E. serotinus* var. taken at Adel Dam (now Golden Acre Park), Leeds, during October, 1930, by beating oak. All three specimens represent the yellow-bodied *abdominalis*, which is the only form of the species yet recorded in this country.—W. D. HINCKS and J. R. DIBB.

VIOLA CANINA L. AT AUSTWICK MOSS

During June, on the occasion of a field meeting of the Botanical Society and Exchange Club, this species was noted in small quantity on the western edge of Austwick Moss. Though recorded for 102 vice-counties, the true Dog Violet is very rare in Yorkshire and I had not previously seen it in the West Riding. Only two localities are given by Baker for North Yorkshire, one in each vice-county.—W. A. SLEDGE.

ORCHIS PURPURELLA STEPH

The records given for *Orchis latifolia* in Lees' 'Flora' all relate to *O. purpurella*, which occurs in several stations

near Austwick, at Kilnsey and Arncliffe, and is probably of frequent occurrence throughout Upper Wharfedale, Airedale, and the Craven area. Lees also gives the following entry, 'Askham Bogs (with the preceding species); B.B. Le Tall [but I doubt].' The 'preceding species' refers to *O. incarnata*, which is still plentiful there. On June 19th I noted a single specimen of *O. purpurella* at Askham Bog, and I have little doubt that it was the same species which Le Tall recognised as distinct from *O. incarnata* and recorded as *O. latifolia*. This is the only station in the West Riding in which I have seen the species away from the hill country.—W. A. SLEDGE.

SPREAD OF THE LARGE ELEPHANT HAWK-MOTH (*DEILEPHILA*
ELPENOR LINN.) IN THE SCARBOROUGH AREA

It is well known that during the last 25 years the Narrow-leaved Willow-herb (*Epilobium angustifolium* Linn) has very much extended its range, and in *The Naturalist*, 1927, p. 326, Mr. H. J. Burkill enquires as to whether the Large Elephant Hawk has also increased its numbers. In the Scarborough area it has certainly done so. When I first came here in 1919 the moth was undoubtedly rare, but in about the last five years it has increased in numbers to such an extent that it occurs almost anywhere in or near the town when the food-plant occurs in quantity. It has been taken in numbers on Seamer Moor, and this year I have taken two specimens walking on paths on the outskirts of the town, while others have been either reported or brought to me from various parts of the suburbs. Some of these have been unhealthy, for full-grown specimens have shrivelled and died without either feeding or attempting to spin up. Curiously enough, the same thing has happened with a full-fed larva of the Eyed Hawk, reported by Mr. W. J. Clarke, and with larvæ of the Poplar Hawk.—GEO. B. WALSH, Scarborough.

BEETLE TIMBER PESTS

Mr. A. Smith, of York, has recently submitted to me two species of beetle which are causing damage. *Caulotrupis æneopiceus* Boh. was sent in both the larval and perfect state from floor boards in the Judge's House at York, these being removed and destroyed. Fowler (*Brit. Col.*, V., 395) says that it occurs in rotten wood of old wine casks, old posts, etc. This is a new Yorkshire record, though Dr. Fordham tells me that it has been recorded by Dr. Charter from Birkdale.

Euoptogaster Scolytus Fabr. has damaged elms at York during the current year to such an extent that some have died. The same thing occurred at Springhead, near Hull, over thirty years ago.—GEO. B. WALSH, Scarborough.

YORKSHIRE NATURALISTS AT HOVINGHAM

THE last of the 1935 season's excursions was to Hovingham on August 3rd to 5th. The fine weather, a kind permission to go anywhere on Sir Wm. Worsley's estates, and a supplementary invitation from Capt. Worsley's wife to see the grounds made the occasion most enjoyable. We were also fortunate to get the Hovingham schoolmaster, Mr. W. J. Moore, to plan the routes and act as guide. The only trouble was due to the fine weather, for the drought had dried up the countryside and the plants and insects had accomplished their year's work at a much earlier date than usual. The district proved very inviting to naturalists and we must trust that an opportunity of revisiting it will be available in the future at a more opportune season when the birds, insects, and plants are to be seen more advantageously. Perhaps the most interesting ground was that on the further side of Southwood from Airyholme towards Wath; here we were given accounts of boggy areas where cattle were sometimes deeply immersed. The drought had altered this but large areas of *Glyceria aquatica* Wahl. some three feet high, showed that conditions were far from normal, and that places we walked over in comfort might not be passable at another time.

For the geologists, Mr. J. Wray had given instructions to his quarry men to put aside any fossils they came across at the time of our visit, and the Rev. G. H. Richardson, of Oswaldkirk, met us at the quarries and helped by pointing out the many species. He had prepared the following list of fossils which may be found in the quarries alongside the road from Hovingham to Malton.

ANTHOZOA

<i>Montlivaltia dispar.</i>	<i>Thamnastrea arachnoides</i>
<i>Thecosimilia annularis</i>	<i>T. concinna</i>
<i>Isastræa explanata</i>	<i>Stylina tubulifera</i>

LAMELLIBRANCHIA

<i>Chlamys nattheimensis</i>	<i>Astarte ovata</i>
<i>C. inæquicostata</i>	<i>Navicula quadrisulcata</i>
<i>C. fibrosa</i>	<i>Barbatia pectinata</i>
<i>Lima zonata</i>	<i>Lithophaga inclusa</i>
<i>L. mutabilis</i>	<i>Exogyra nana</i>
<i>Lopha gregarea</i>	<i>Ctenostreon proboscideum</i>
<i>Gryphæa dilatata</i>	<i>Velata anglica</i>
<i>Camptonectes lens</i>	<i>Opis phillipsi</i>
<i>Lucina sp.</i>	

GASTROPODA

<i>Pseudomelania heddingtonensis</i>	<i>Pleurotomaria reticulata</i>
<i>Littorina muricata</i>	<i>P. agassizi</i>
<i>Cylindrites sp.</i>	<i>P. muensteri</i>
<i>Natica sp.</i>	<i>P. Bourguetia striata</i>
<i>Nerinea</i>	

ECHINODERMATA

<i>Cidaris florigemma</i>	<i>Glypticus hieroglyphicus</i>
<i>Neucleolites scutatus</i>	

MISCELLANEOUS

<i>Pentacrinus</i>	<i>Serpulæ</i>
<i>Belemnites abbreviatus</i>	<i>Perisphinctes sp.</i>
	<i>Aspidoceras sp.</i>

Vertebrate Section: Mr. H. B. BOOTH writes: Birds were very quiet and difficult to observe in the thick foliage. The long-tailed titmouse appeared to be common, and the most pleasant sight seen by the ornithologists was a flock of quite 150 small birds working along

among the trees and bushes and feeding on their way. Nearly half consisted of long-tailed tits, and among them were several other species of titmice, goldcrests, chaffinches, etc. Other species noted were the green woodpecker, jay, sparrow-hawk, woodcock, and redstart; and a family party of carrion crows was much in evidence. The turtle dove was heard, and the nuthatch was reported in Hovingham Park, about a mile from the entrance gates.

At Wiganthorpe Hall close by, a pair of great-crested grebes nests annually on the lake, and they are present this season. This site, and the one at Castle Howard, are the only regular nesting places of this species in the North Riding known to the writer.

In mammals the North American grey squirrel was seen, and we were informed by the head woodman that this species is common and that the British squirrel is now very scarce.

Entomology (J. M. BROWN): Although the weather was all that could be desired for entomological work the first day's excursion through the woods to Stocking Hill proved rather disappointing, yielding comparatively few species of interest, among which, however, were *Megacoelum infusum* beaten from oak, and *Bythoscopus microcephala* swept from rockrose. The second and third days' excursions took us to more low-lying country, and here insect life was more abundant, and the carrs below South Wood appeared very rich indeed, especially in Hemiptera, and some intensive collecting carried on here and on Hovingham Carrs for a couple of days yielded excellent results.

COLEOPTERA.—While working at other orders, a number of beetles were collected, and though not very plentiful, some interesting species were taken. Perhaps the best were *Phyllotritica quadrimaculata* and *Metæcus paradoxus*, the latter passing its young stages in the nests of the wasp. The species taken included:

<i>Tachyporus obtusus</i> L.	<i>Haltica olivacea</i> L.
<i>Quedius cruentus</i> Ol.	<i>Lochmæa capræ</i> L.
<i>Xantholinus punctulatus</i> Pk.	<i>Phyllotreta nemorum</i> L.
<i>Stenus flavipes</i> Steph.	<i>Galerucella tenella</i> L.
<i>S. pallitarsus</i> Steph.	<i>Cassida flaveola</i> Thunb.
<i>Phleostiba plana</i> Pk.	<i>Larva villosa</i> F.
<i>Aphidecta obliterata</i> L.	<i>Sitona lineatus</i> L.
<i>Coccinella 2-punctata</i> L.	<i>S. hispidulus</i> F.
<i>C. 10-punctata</i> L.	<i>Strophosomus coryli</i> F.
<i>Mysia oblongoguttata</i> L.	<i>Phytonomus nigrivestris</i> F.
<i>Anatis ocellata</i> L.	<i>P. plantaginis</i> DeG.
<i>Halyzia 16-guttata</i> L.	<i>Ceuthorrhinchus pleurostigma</i> Marsh.
<i>Calvia 14-guttata</i> L.	<i>C. pollinarius</i> Forst.
<i>Sinodendron cylindricum</i> L.	<i>Anthonomus rubi</i> Hbst.
<i>Adrastus nitidulus</i> Marsh.	<i>Orchestes quercus</i> L.
<i>Cantharis pallida</i> Goez.	<i>O. avellanæ</i> Don.
<i>C. bicolor</i> Hbst.	<i>Mecinus pyrastrer</i> Hbst.
<i>Rhagonycha fulva</i> Scop.	<i>Cionus scrophulariæ</i> L.
<i>Malthinus flaveolus</i> Pk.	<i>Rhynchites betulæ</i> L.
<i>M. frontalis</i> Marsh.	<i>R. nanus</i> Payk.
<i>Lema puncticollis</i> Curt. (<i>cyaneola</i>).	<i>Myelophilus piniperda</i> L.
<i>Cryptocephalus labiatus</i> L.	<i>Rhinosisimus planirostris</i> F.
<i>Phyllotritica 4-maculatus</i> L.	<i>Metæcus paradoxus</i> L.
<i>Crepidodera transversa</i> Marsh.	

I have to thank Dr. W. J. Fordham for looking over and checking the names of most of these beetles.

HEMIPTERA.—The district proved to be a rich one for plant-bugs and hoppers, and quite a number of comparatively rare species were taken, including a number new to the county. The various woods worked

through seemed rather barren of species, and beating the trees yielded few interesting forms, while sweeping in the more open ground in the low-lying areas was most productive. Altogether over 120 species were collected. An interesting capture was that of the wax-covered scale insect, *Orthezia urticæ*, which was quite plentiful in one spot on the Stitchwort. As this region has not been worked before, the full list of species taken is given :

HETEROPTERA

- Pentatoma rufipes* L.
Elasmucha griseus L. } These two species were plentiful
Elasmotethus interstinctus } on Hazel.
Metacanthus elegans Curt., on *Ononis*.
Cymus glandicolor Hahn.
C. clavicularius Fall. Previously taken in Yorkshire only on Allerthorpe
Common.
Drymus sylvaticus F.
Scolopostethus thomsoni Reut.
Piesma maculata Lap.
Tingis cardui L.
Acanthia saltatoria L.
Velia currens F.
Reduviolus flavomarginatus Sch.
R. rugosus L.
Dolichonabis limbatus Dahl.
Anthocoris confusus Reut.
A. nemoralis F.
A. gallarum-ulmi DeG.
A. nemorum L.
Acompocoris pygmæus Fall.
Orius (*Triphleps*) *majuscula* Reut.
Microphysa elegantula Baer., on oak.
Pithanus mærkeli HS.
Stenodema calcaratum Fall.
S. lævigatum L.
S. holsatum F.
Trigonotylus ruficornis Fourc.
Teratocoris saundersi D. and S., in damp vegetation.
Miris ferrugata Fall.
M. dolabrata L.
Monalocoris filicis L.
Bryocoris pteridis Fall., short-winged form.
Phytocoris tilia F.
P. longipennis Flor.
P. pini Kb.
P. ulmi L.
Calocoris sex-guttatus F.
C. norvegicus Gmel.
Megacælum infusum HS., on oak.
Stenotus binotatus F., very plentiful.
Lygus pabulinus L.
L. contaminatus Fall.
L. pratensis L.
L. campestris L.
L. rubricatus Fall.
Peociloscytus unifasciatus F., plentiful on Galium.
Liocoris tripustulatus F.
Brachyceræa epilobii Reut.
B. stachydis Reut.
B. globulifer Fall., on Campion.

Blepharidopterus angulatus F.

Mecomma ambulans Fall.

†*Cyrtorrhinus pygmaeus* Zett., at the base of rushes, and strangely the more common *C. caricis* was not seen.

Heterotoma meriopterum Scop., one specimen beaten from oak.

Malacocoris chlorizans Fall.

Lopus (Onychumenus) decolor Fall., an interesting species from dry grass.

Macrotylus solitarius Mey., on *Stachys*.

M. paykulli Mey., plentiful on *Ononis*.

Phylus coryli v. *avellanæ* Mey.

P. melanocephalus L.

Psallus varians HS.

P. alnicola D. LS.

P. roseus F.

Atractotomus magnicornis Fall.

Plagiognathus chrysanthemi Wolff.

P. arbustorum F.

HOMOPTERA

I was fortunate in securing a considerable number of very interesting species new to the county.

Cercopsis alni Fall.

Philænus spumarius L.

f. *populi* Fab.

f. *præusta* Fab.

f. *vittatus* Fab.

f. *marginellus* Fab.

f. *leucophthalmus* L.

P. lineatus L.

Ulopa reticulata Fab.

Megophthalmus scanicus Fall.

Cicadella viridis L., plentiful in damp vegetation.

Euacanthus interruptus L.

E. acuminatus Fab., not common.

†*Bythoscopus (Batracomorphus) microcephala* HS., swept from rockrose.

Oncopsis rufusculus Fieb.

Idiocerus lituratus Fall. and *I. confusus* Flor., on Sallow.

Agallia puncticeps Germ.

Aphrodes nervosus Schr.

A. albifrons L.

A. bifasciatus L.

Eupelix cuspidata Germ., an interesting species not uncommon among dry grass.

Doratura stylata Boh., another interesting species from grass.

†*Stictocoris preyssleri* HS., one specimen only was obtained, again by sweeping among grass.

Euscelis plebejus Fall.

E. lineolatus Brulle.

E. obsoletus Kbm. and var. *piceus* Scott, common among grass.

Hardya melanopsis Hdy., quite plentiful

Deltocephalus pascuellus Fall., fairly numerous.

D. ocellaris Fall.

D. pulicaris Fall.

D. distinguendus Flor.

Jassus mixtus Fab.

Thamnotettix prasinus Fall.

T. subfuscus Fall.

Limotettix sulphurella Zett.

L. nigricornis Sahl., quite plentiful in damp grass.

L. 4-notata Fab.

Alebra albostriella Fall.

Empoasca smaragdula Fall.

Eupteryx notatus Curt., common among grass.

E. auratus L.

E. stachydearum Hdy.

E. atropunctata Goeze.

E. signatipennis Boh., common on Meadow Sweet.

Eurhadina pulchellus Fall., on oak.

Cixius nervosus L. and *C. brachycranus* Fieb.

Megamelus notula Germ., long and short-winged forms.

† *Stenocranus longipennis* Curt., not very plentiful.

Kelisia vittipennis Sahl., fairly plentiful among grass.

Conomelus limbatus Fall., short and long-winged forms.

† *Delphacodes leptosoma* Flor., swept from damp grass.

† *D. exigua* Boh., swept from grass, fairly plentiful.

D. fairmairei Perris., swept from grass.

D. pellucida Edw., long and short-winged forms, common in grass.

Dicranotropis hamata Boh., at the bases of rushes, common.

Livia juncorum Latr., common on rushes.

Aphalara picta Zett., swept from Crepis.

Psyllopsis fraxini L., a strikingly marked species.

Psylla mali Schm., on Crab Apple.

P. ulmi Forst.

Arytæna genistæ Latr.

Trioza urticæ L.

COCCIDAE

Orthezia urticæ L. on *Stellaria holostea* in various stages.

NEUROPTERA

Insects of this order did not seem to be at all plentiful, and few species were taken.

Panorpa communis L. and *P. germanica* L., our two commonest Scorpion-flies, both occurred. *Hemerobius simulans* Walk., *Chrysopa vittata* Waesm., *C. ciliata* Waesm., and *C. perla* L. were the only Lace-wing-flies noted.

PSOCOPTERA

These small insects were not specially looked for, and naturally not many were obtained, but amongst them was *Ectopsocus briggsi*, a species not frequently taken in Yorkshire.

Those taken included :—

† *Psocus gibbosus* Sulz., one of the largest species, on oak.

Lænsia variegata Latr., also from oak.

Graphopsocus cruciatus L.

Stenopsocus immaculatus Steph.

Cæcilius flavidus Steph.

Peripsocus phæopterus Steph.

Ectopsocus briggsi McL., an occasional species.

Mesopsocus unipunctatus Müll.

Elipsocus westwoodi McL.

E. hyalinus Steph.

E. cyanops Rost., from pines.

Philotarsus flaviceps Reut.

PLECOPTERA

The district does not seem to be very favourable for Stone-flies, although a number of streams occur. Most of the specimens taken were obtained near a small stream flowing into Wath Beck. Although so few species were seen, those taken included two of the less well-known

Species marked † appear to be new to Yorkshire.

ones, viz., *Leuctra moselyi* Mort., of which several specimens were taken, and *Amphinemura standfussi* Ris., of which one only was obtained. Other species taken were : *Leuctra fusciventris* Steph., *L. nigra* Oliv., *Nemurella inconspicua* Pict., and *Chloroperla grammatica* Scop.

EPHEMEROPTERA

Mayflies appeared to be extremely scarce, and practically none were seen till a short evening walk to Marr's Beck revealed *Paraleptophlebia cincta* Retz., flying in swarms across the road. On returning to the same place the next evening, I was surprised to find that the Mayflies had disappeared, and in their place were equal swarms of ants.

The only other Mayflies seen were *Habrophlebia fusca* Curt. and *Centroptilum luteolum* Müll.

TRICHOPTERA

As was the case with the Mayflies, so the Caddisflies were distinctly scarce, and those obtained were taken in the neighbourhood of Wath Beck and Marr's Beck. They included :—

<i>Glyptotælius pellucidus</i> Retz.,	<i>Leptocerus aterrimus</i> Steph.
a striking insect.	<i>L. albifrons</i> L.
<i>Limnophilus stigma</i> Curt.	<i>Psychomyia pusilla</i> Fabr.
<i>L. auricula</i> Curt.	<i>Polycentropus flavomaculatus</i>
<i>Silo pallipes</i> Fabr.	Pict.
<i>Lepidostoma hirtum</i> Fabr.	<i>Rhyacophila dorsalis</i> Curt.

Coleoptera : Mr. G. B. WALSH adds : As is usual in August, beetles were generally uncommon. *Halicta oleracea* L. and *Batophila rubi* Payk. were, however, swept in plenty. *Meligethes æneus* F., *viridescens* F., and *picipes* Sturm. were fairly common, as was *Galerucella tenella* L. in marshy places. *Cionus scrophulariæ* L. occurred on figwort, *Rhynchites nanus* Payk. on Sallow, and *Apion simile* Kirby on birch. On pines occurred many of the species to be expected—*Coccinella 7-punctata* L., *Aphidecta oblitterata* L., *Mysia oblongoguttata* L., *Anatis ocellata* L., *Myrrha 18-guttata* L., and, recorded by the woodman as damaging fine shoots, *Myelophilus piniperda* L.

Lepidoptera : Both imagines and larvæ were by no means common. The butterflies seen were the Large White, Small White, Green-veined White, Meadow Brown, Small Copper, Common Blue, and Silver-washed Fritillary ; and the moths were the Large Emerald and the Antler Moth.

The larvæ beaten were those of the Buff-tip (common on copper beech), White Wave, Broom Moth, Grey Dagger, Cinnabar, and Pale Tussock.

Hymenoptera : The larvæ of the Pine Sawfly (*Luphyrus pini*) were very abundant on pines at the borders of the wood.

Mr. ROSSE BUTTERFIELD writes : The Crabro you sent through the post is *Solenius vagus*. It is not considered rare, though I have not often seen it in my travels.

The Hymenoptera are : *Halictus morio*, *Solenius vagus*, *Symmorphus sinuatus* Fab., *Vespa norvegica*, *V. sylvestris*, *Bombus venustus*, *B. latreillus*, *B. derhamellus*, *B. lapidarius*, *B. terrestris*, *Forica fusculus*, *Lasius flava*, *Chrysis viridula*, *Tenthredopsis littorata*, *Allantus scrophularia* *Ichneumon extensorius*.

Lepidoptera : *Argynnis aglaia*, *Hesperia thaumas* (linea), *Satyrus janira*, *Chortobius pamphilus*, and the Tortoiseshell and Green-veined White.

Charæus graminis, *Tanagra chærophyllata*, *Hysipetes elutata*, *Herbula cespitalis*.

Diptera : CHRIS. A. CHEETHAM : Two-winged flies were not plentiful, careful search producing only two species of *Tipula* and very few specimens

of these, *T. scripta* Mg. and *T. lateralis* Mg. nor were other Limnobiids more frequent, they included *Limnophila lucorum* Mg., *L. nemoralis* Mg., *Limnobia bifasciata* Schrk., *Rhiphidia maculata* Mg., *Empeda flava* Schum., *Molophilus appendiculatus* Stæg.

The most interesting captures were the Asilid *Neoitamus cyanurus* Lw., the wasp-like *Conops flavipes* L. and its associate *Sicus ferrugineus* L. and a single specimen of the beautiful Cleg *Chrysops cæcutiens* L.

Syrphids were not plentiful, I got *Catabomba pyrastris* L., *Syrphus albostrigatus* Fln., *Ischyrosyrphus laternarius* Müll., *Helophilus pendulus* L., *Eristalis arbustorum* L., *E. horticola* Deg., *Chilosia illustrata* Harr., *C. pulchripes* Lw., *Chrysogaster solstitialis* Fln., *C. splendens* Mg., *Xylota segnis* L., *Pyrophæna granditarsa* Forst., *Sphærophoria scripta* L., *Syritta pipiens* L.

Among the Dolichopods were *Dolichopus plumipes* Scop., *Chrysotus gramineus* Fln., and *Hypophyllus obscurus* Fal.

Among the remainder of the captures were *Pipunculus campestris* Ltr., *Tephritis miliaria* Schrk., *Ceromasia senilis* Mg., *Dexiosoma caninum* F., *Oliveria lateralis* F., *Trixa æstroidea* Dsv., *Erigone radicum* F., *Graphomyia maculata* Scop., *Balioptera tripunctata* Fln., *Limnia unguicornis* Scop., *Tetanocera elata* F.

Flowering Plants : Miss C. M. ROB : The flora of the district visited on the Monday was very interesting, many of the plants were dried almost beyond recognition, especially on the higher ground. In the woods were found *Actea spicata*, *Inula squarrosa*, *Astragalus glycyphyllos*, *Campanula latifolia*, *Lithospermum officinale*, and *Euonymus europæus*. The marshy ground and stream side yielded *Stachys palustris*, *Calamagrostis canescens*, *Carex paniculata*, *Comarum palustre*, *Menyanthes trifoliata*, *Glyceria aquatica*, *Scirpus fluitans*, *S. sylvaticus*, and *Apium nodiflorum*.

In the Quarry were *Picris Hieracoides*, *Bromus erectus*, and *Calendula officinalis*; *Papaver somniferum* and *Chrysanthemum parthenium* escaped from near-by gardens. Other plants of interest seen were *Carduus eriophorus*, a white-flowered form of *Carduus nutans* and a teratological form of *Plantago lanceolata*.

Mosses : The dry conditions made collecting difficult and more time is necessary to find out the best localities. Dr. T. H. B. BEDFORD gathered the following :

Amblystegium filicinum De Not.
A. serpens B. & S.
Anomodon viticulosus H. & T.
Brachythecium purum Dixon.
B. rutabulum B. & S.
Bryum capillare L.
Camptothecium sericeum Kindb.
Catharina undulata W. & M.
Dicranella heteromalla Schp.
Dicranoweisia cirrata Lindb.
Dicranum majus Turn.
D. scoparium Hedw.
Encalypta streptocarpa Hedw.
Eurhynchium myurum Dixon.
E. rusciforme Milde.
E. striatum B. & S.
E. tenellum Milde.
E. crassinervium B. & S.
Fissidens adiantoides Hedw.
F. taxifolius Hedw.

Grimmia apocarpa Hedw.
Hylocomium squarrosum B. & S.
H. triquetrum B. & S.
Hypnum cupressiforme L.
H. molluscum Hedw.
H. schreberi Willd.
Mnium hornum L.
M. undulatum L.
Neckera crispa Hedw.
N. complanata Huebn.
Plagiothecium denticulatum B. & S.
P. undulatum B. & S.
Polytrichum commune L.
P. formosum Hedw.
Thuidium tamariscinum B. & S.
Tortula muralis Hedw.
Webera carnea Schp.
W. nutans Hedw.
Weisia verticillata Brid.

Fungi: Mr. W. G. BRAMLEY:

Amanita rubescens
Lentinus lepidens
Russula nigricans
Boletus elegans
Polyporus squamosus
P. sulphureus on Yew
P. betulinus
P. hispidus

Fomes appanatus
Polystichus versicolor
Stereum hirsutum
Phallus impudicus
Hirneola auricula judæ
Hypoxylon coccineus
Hypocrea rufa

Uromyces alchemilla
U. acetosa
U. polygoni
U. rumicis
U. dactylidis
Puccinia festucae on *Lonicera*
P. conii on *Conium*
P. variabilis
P. Taraxaci } on *Taraxacum*
P. caricis on *C. acutiformis*
P. amhenatheri on *A. elatior*
P. glumarum on wheat
P. holcina on *H. mollis*
P. bromina on *Bromus mollis*
P. simplex on barley
P. circii on *C. lanceolatum*
P. obtegens on *C. arvense*

P. betonoca on *S. betonica*
P. pulverulenta on *C. hirsutum*
P. baryi on *Brachypodium*
Triphragmium ulmarie
Phragmidium violaceum on *Rubus* sp.
P. disciflorum on *Rosa canina*
Xenodocus cerbonarius
Coleosporium Tussilajinis
C. petasitis
C. sonchi
Peronospora myosotidis on *Myosotis*
 sp.
P. effusa on *Chenopodium album*.
Spherotheca pannosa
Erysiphe graminis
E. polygoni

Mr. A. E. PECK, in a note on a specimen submitted to him, says: The Agaric was *Amanita strobiliformis*. Our largest *Amanita*. Rare. No authentic record in the *Yorkshire Fungus Flora* but the writer has two Scarborough records.

REA says: 'Habitat: Downs and woods, especially on chalk; locally common, rare elsewhere.' Specimen found measured 7 in. by 6 in. pileus and weighed 7 oz., the most substantial specimen of *Amanita* which I remember to have met with.

Taste: pleasant, and Rea quotes as 'Edible' but I did not eat it as most of the genus are poisonous or suspect, with the notable exception of the well differentiated *A. rubescens* which I have eaten frequently.

The Entomologist for October contains 'New Forms of Nymphalinae and Ithomiinae,' by A. Hall (with plate); 'The Variation of *Eucosma solandriana* L., *E. brunnichana* L. (= *sinuana* Schiffermuller and Hubner, and *E. piceana* Haw) (= *semifuscana* Stphs) (Lep. Tortricidae),' by W. G. Sheldon; 'The Crabtree Collection,' by W.R.S.; 'Records of African Bees,' by T. D. A. Cockerell; and several Notes and Observations.

The Entomologist's Monthly Magazine for October contains 'The Parasites of British Birds and Mammals. IV. Records of Mammal Parasites,' by G. B. Thompson; 'Systematic Notes upon British Aquatic Coleoptera. Part VIII. Rantus,' by F. Balfour-Browne (with figures); 'Notes on the American Species of Colydiodes (Coleoptera, Colydiidae),' by H. E. Hinton (with figures); 'Notes on the Season, 1934-35, in New Zealand,' by G. V. Hudson; 'A Suggested Explanation of Variation in Cryptic Lepidoptera,' by G. D. H. Carpenter; 'Some New British Sawflies,' with notes on synonymy, etc. (Hymenoptera, Symphyta), by R. B. Benson; and several short notes including '*Osmylus fulvicephalus* Scop. (Neuroptera), in Sheffield,' by J. M. Brown (several in Ecclesall Woods in June).

ENTOMOLOGY OF THE HELMSLEY DISTRICT

JAMES M. BROWN, B.Sc., F.L.S., F.R.E.S.

WHILE at the meeting of the Yorkshire Naturalists' Union at Helmsley during the early part of September, in connection with the Fungus Foray, I was able to collect a number of insects of various orders. Although it was rather late in the season, and insects were not very plentiful, a number of those obtained are of some interest, some are not very common, and at least one is new to the vice county.

I have to thank several members present, especially Mrs. Morehouse and Messrs. W. G. Bramley and J. W. H. Johnson, for handing me specimens of interest.

LEPIDOPTERA

A fair number of butterflies were noticed, including Whites, Tortoiseshell, Small Copper, Common Blue, Meadow Brown, and Small Heath. Caterpillars were numerous, perhaps the most striking being that of the Grey Dagger Moth (*Acronycta psi*).

COLEOPTERA

Though beetles were not very numerous, some good captures were made, the most interesting being *Platycis minuta*, which occurred in most of the woods visited, and *Endomychus coccineus*, which was taken under bark. (Dr. W. J. Fordham has been good enough to check most of the following beetles). Species taken included :

<i>Dromius 4-maculatus</i> L.	<i>Lema melanopa</i> L.
<i>Ontholestes tessellatus</i> Geoff.	<i>Chrysolina varians</i> Schal.
<i>Stenus similis</i> Hbst.	<i>Galerucella tenella</i> L.
<i>Phaganthus caraboides</i> L. (<i>testacea</i> Gr.)	<i>Halitica oleracea</i> L.
<i>Endomychus coccineus</i> L.	<i>Cassida viridis</i> L.
<i>Thea 22-punctata</i> L.	<i>Sitona hispidulus</i> F.
<i>Mysia oblongoguttata</i> L.	<i>Orchestes fagi</i> L.
<i>Chilocorus bipustulatus</i> L.	<i>Scolytus destructor</i> Ol.
<i>Agrilus angustulus</i> Ill.	<i>Rhinosimus planirostris</i> F.
<i>Platycis minuta</i> F.	

HEMIPTERA

Plant-bugs were more numerous, though most of those taken belong to common species. *Pentatoma rufipes* occurred in several of the woods, but the only specimen of *Elasmotethus interstinctus* seen was rescued from a foraging party of wood ants (*Formica rufa* L.). (It is interesting to note that this ant did not appear to be very common in the district, about four nests only being noticed, and these were all in Riccal Dale.) The most interesting of the plant-hoppers were *Stenocranus minutus* and *Kelisia vittipennis*.

HETEROPTERA

<i>Pentatoma rufipes</i> L.	<i>P. longipennis</i> Flor.
<i>Elasmotethus interstinctus</i> L.	<i>Lygus pabulinus</i> L.
<i>Drymus sylvaticus</i> F.	<i>L. contaminatus</i> Fall.
<i>Tingis cardui</i> L.	<i>L. pratensis</i> L.
<i>Reduvius rugosus</i> L.	<i>L. cervinus</i> HS.
<i>Dolichonabis limbatus</i> Dahl.	<i>L. rubricatus</i> Fall.
<i>Temnostethus pusillus</i> HS.	<i>Brachyceræa stachydis</i> Reut.
<i>Anthocoris nemorum</i> L.	<i>B. globulifer</i> Fall.
<i>Stenodema calcaratum</i> Fall.	<i>Cyllocoris histrionicus</i> L.
<i>S. lævigatum</i> L.	<i>Blepharidopterus angulatus</i> F.
<i>S. holsatum</i> F.	<i>Malacocoris chlorizans</i> Fall.
<i>Monalocoris filicis</i> L.	<i>Psallus alnicola</i> D. and S.
<i>Phytocoris tilæ</i> F.	

HOMOPTERA

<i>Philænus spumarius</i> L.	<i>Limotettix 4-notata</i> Fabr.
<i>P. lineatus</i> L.	<i>Alebra albostrigata</i> Fall.
<i>Cercopis alni</i> Fall.	<i>Empoasca smaragdula</i> Fall.
<i>Bythoscopus lani</i> L.	<i>Typhlocyba quercus</i> Fab.
<i>Euacanthus interruptus</i> L.	<i>Erythroneura alneti</i> Dahl.
<i>Aphrodes albifrons</i> L.	<i>Cixius brachycranus</i> Scott.
<i>Hardya melanopsis</i> Hdy.	<i>Stenocranus minutus</i> Fab.
<i>Deltocephalus ocellaris</i> Fall.	<i>Kelisia vittipennis</i> Sahl.
<i>D. pascuellus</i> Fall.	<i>Psyllopsis fraxini</i> L.
<i>D. distinguendus</i> Flor.	<i>Psylla buxi</i> L.
<i>Jassus mixtus</i> Fab.	<i>P. alni</i> L.
<i>Thamnotettix splendidulus</i> Fab.	

NEUROPTERA

Three species of Lacewing-flies only were seen, viz. :—

<i>Hemerobius marginatus</i> Steph.	<i>C. perla</i> L.
<i>Chrysopa flava</i> Scop.	

PSOCOPTERA

Among the Psocoptera obtained was one species, *Pteroxanium squamosum*, new to V.C.62, and the not common species, *Psocus nebulosus* and *Ectopsocus briggsi*.

Species taken :

<i>Psocus nebulosus</i> Steph.	<i>C. obsoletus</i> Steph.
<i>Amphigerontia bifasciata</i> Latr.	<i>Ectopsocus briggsi</i> McL.
<i>Stenopsocus immaculatus</i> Steph.	<i>Philotarsus flaviceps</i> Steph.
<i>Cæcilius flavidus</i> Steph.	<i>Pteroxanium squamosum</i> End.

EPHEMEROPTERA

The only species of Mayflies noted were :

<i>Habrophlebia fusca</i> Curt.	<i>Ecdyonurus longicauda</i> Steph.
<i>Centroptilum luteolum</i> Müll.	

PLECOPTERA

Only two species of Stonefly were seen as adults, *Leuctra geniculata* Steph. and *L. fusciventris* Steph., and the nymph of *Perla cephalotes* occurred in Riccal Dale.

TRICHOPTERA

The best species of Caddisflies were taken in Riccal Dale, although in some parts of the dale, especially the lower region, the stream was practically dry.

<i>Limnophilus auricula</i> Curt.	<i>Mystacides azurea</i> L.
<i>Stenophylax stellatus</i> Curt.	<i>Psychomyia pusilla</i> Fab.
<i>S. vibex</i> Curt.	<i>Wormaldia</i> sp. (female).
<i>Lepidostoma hirtum</i> Fab.	<i>Glossosoma vernale</i> Pict.
<i>Lasiocephala basalis</i> Kol.	<i>Rhyacophila oblitterata</i> McL.

COLLEMBOLA

Few of these inconspicuous insects could be collected in passing. These included :

<i>Achorutes muscorum</i> Templ.	<i>Lepidocyrtus lanuginosus</i> Gmel.
<i>Isotomurus palustris</i> Müll.	<i>L. cyaneus</i> Tullb.
<i>Entomobrya nivalis</i> L.	<i>Tomocerus minor</i> Lubb.
<i>Orchesella cincta</i> L.	<i>Dicyrtomina minuta</i> Fabr.
<i>O. villosa</i> L.	

ENTOMOLOGISTS AT BUTTERCRAMBE WOODS

W. D. HINCKS, M.P.S., F.R.E.S.

ON June 22nd, the Entomological and Plant Galls Sections of the Yorkshire Naturalists' Union held their annual field meeting at Buttercrambe Woods, near Stamford Bridge.

Weather conditions proved entirely favourable but the cumulative effect of the past two dry seasons was only too evident in the small numbers of even common insects.

It was a pleasant surprise therefore on working through the material captured to find three additions to the county list. These are recorded below together with all the species taken which are additional to the two lists previously recorded from this locality (*Naturalist*, 1927, p. 243 and 1928, p. 281-283).

LEPIDOPTERA : Reported by Mr. G. Bennett, Keighley.

<i>Pieris rapae</i> L.	<i>Lomaspilis marginata</i> L.
<i>P. napi</i> L.	<i>Melanippe sociata</i> Bork.
<i>Euchloë cardamines</i> L.	<i>M. montana</i> Bork.
<i>Polyommatus phlæas</i> L.	<i>Porthesia similis</i> Fues. Larva.
<i>Hesperia thauas</i> Hufn.	<i>Oxygia antiqua</i> L. Larva.
<i>Cabera pusaria</i> L.	<i>Dasychira pudibunda</i> L. ♀ and ♂.
<i>C. exanthemata</i> Scop.	

COLEOPTERA : Mr. J. R. Dibb and the writer record the following :—

<i>Harpalus æneus</i> F. (sweeping).	<i>Cantharis nigricans</i> Ml.
<i>Dromius quadrimaculatus</i> L.	<i>C. pallida</i> Gz.
<i>Hydroporus memnonius</i> Nic.	<i>Rhagonycha limbata</i> Th.
<i>Agabus guttatus</i> Pk.	<i>Molorchus minor</i> L.
<i>Helophorus aquaticus</i> L.	<i>Strangalia maculata</i> Poda.
<i>Olibrus æneus</i> F.	<i>Grammoptera nificornis</i> F. !
<i>Coccinella Septempunctata</i> L.	<i>Tetrops præusta</i> L.
<i>Brachypterus urticæ</i> F.	<i>Aphthona nonstriata</i> Gz. !!
<i>Nitidula bipunctata</i> L. (dead bird).	<i>Crepidodera ferruginea</i> Sp.
<i>Rhisophagus bipustulatus</i> F.	<i>Chalcoides aurata</i> Mm.
<i>Cryptophagus scanicus</i> L.	<i>Cassida flaveola</i> Th.
<i>Dermestes murinus</i> L. } (dead	<i>C. rubiginosa</i> Ml.
<i>D. lardarius</i> L. } bird).	<i>Rhynchites mannerheimi</i> Hu.
<i>Athous hemoirboidalis</i> F.	<i>Phyllobius urticæ</i> D.G.
<i>Agriotes pallidulus</i> Ill.	<i>P. argentatus</i> L.
<i>Dolopius marginatus</i> L.	<i>P. maculicornis</i> Gm.
<i>Denticollis linearis</i> L.	<i>P. pomonæ</i> Ol.
<i>Podabrus alpinus</i> Pk.	<i>Hylastes cunicularius</i> Er. (New
<i>Cantharis livida</i> L.	to Yorkshire).

HYMENOPTERA

<i>Allantus arcuatus</i> Först.	<i>Cephus pygmaeus</i> L.	<i>Athalia lineolata</i> Lep.
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ORTHOPTERA : Determined by Dr. M. Burr.

<i>Acrydus kiefferi</i> Saulcy.	<i>Omocestus viridulus</i> L.
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PLECOPTERA

Nemurella inconspicua Pict.

DIPTERA

<i>Symphoromyia crassicornis</i> Pz.	<i>Dolichopus claviger</i> Stan.
<i>Chrysops cæcutiens</i> L. !	<i>D. signatus</i> Mg.
<i>Leptogaster guttiventris</i> Ztt. One ♂	<i>Chrysotus neglectus</i> W.
(New to Yorkshire).	<i>Xanthochlorus ornatus</i> Hal.
<i>Neotamus cyanurus</i> Lw. ♂ and ♀.	<i>Chilosia albitarsis</i> Mg.
<i>Thereva nobilitata</i> F.	<i>Volucella pellucens</i> L. !
<i>Empis tessellata</i> F.	<i>Xylota sylvarum</i> L.
<i>Edalea flavipes</i> Ztt.	<i>Chyliza vittata</i> Mg. (New to York-
<i>Sciapus wiedemanni</i> Flin.	shire).
	<i>Oxyphora flava</i> Gf.

YORKSHIRE NATURALISTS' UNION

ANNUAL MEETING OF THE BOTANICAL SECTION

CHRIS. A. CHEETHAM

THIS Section held its meeting on Saturday, 12th October, in the Botanical Department, Leeds University, by the kind invitation of its President, Professor J. H. Priestley. In the afternoon officers and members of the various Committees were nominated and the reports of the Secretary and the Conveners of the Committees were read and discussed. After tea, which was kindly provided by Mrs. Priestley, assisted by Mrs. Grist and Miss Scott, a paper was read by Mr. A. Malins Smith on Intermittent Flowering. He dealt with specific cases of Orchids of which he had kept records for a long term of years and he gave evidence showing that in some cases the plants must have persisted underground for one or two seasons. Other cases showed an absence of flowers for varied periods and this is definite evidence in support of the field botanists' good and poor Orchid years. It is to be hoped that Mr. Smith will publish the details of his records. Dr. W. Wright followed with a paper on Lammas Growth, a subject he dealt with in *The Naturalist* a short time ago. He finds that shoots which produce this secondary growth will invariably do so, and he was able to contrast the growth of these with the growth of shoots which do not make this Lammas growth. Dr. W. H. Pearsall then told the interesting story of a recent visit to Lough Renvyle in Connemara when he found *Hydrilla verticillata*, a plant only known in the British Isles previously from Estwaite Lake, where it was discovered by his father and himself many years ago. Dr. W. A. Sledge had a large collection of mounted Central European plants on view which he had himself collected, and Mr. F. E. Milsom had some rare species of Hepatics and Mosses that he had gathered in the Killarney districts, these were in a fresh condition and were much appreciated.

REVIEWS AND BOOK NOTICES

The Atlantean Continent, by H. E. Forrest. Second Edition, 1935, 352 pp. (Witherby, 10s. 6d.) In this second edition, the author has endeavoured to correct a few of the errors of the first edition, but there are still many remaining. The fundamental theory underlying the whole work is not in accordance with the observed facts of glacial geology, and the author makes no attempt to discuss the not inconsiderable geophysical consequences which would result from the formation and disappearance of such a large ice-sheet as he envisages. There is throughout the volume a tendency to make fact subservient to theory. For example, the facts published by Peach and Horne concerning the glaciation of the Orkneys and Shetlands (striæ direction, form of roches moutonnées, trails of erratics) all point to ice crossing those islands from the east—that is, from the North Sea towards the Atlantic. Mr. Forrest disregards the detailed observations of these two authors—he only quotes them at second-hand—and suggests that the ice moved in the opposite direction.

There was confusion in the first edition between the well-known deposits at Bielsbeck and Kirmington—a confusion which is worse confounded in the new edition on page 110 where the Sewby and Kirmington deposits are grouped together as pre-glacial. How did the Boulder clay under the Kirmington fossiliferous clay originate, and who is responsible for finding Forest Bed mammals at this place?

Six appendices give comments on scattered topics, and include an attempt to reconcile the Bermuda boring—cited by critics of the first

edition—with Atlantean subsidence. This attempt fails, for the Oligocene age of the earliest limestones in that island shows that post-Oligocene subsidence is very small.

The present reviewer is unable to comment on the accuracy of the facts and deductions given in the second part of the book dealing with the distribution of plants and animals, but even if the facts here are all correctly stated, we are reminded of Huxleys' famous dictum, 'One ugly fact will destroy the most beautiful theory.' Glacial Geology contains too many such facts for Mr. Forrest's speculation.

The Animal Year Book, Volume 3, pp. vi+182, with plates and illustrations in the text. Edited by **C. M. Knight, D.Lit.** The University of London Animal Welfare Society, 2/6 (2/9 post free). Many writers have contributed to this comprehensive volume, the most important articles being: 'Whales and Animal Welfare,' by A. H. B. Kirkman; 'Oil Pollution of Coastal Waters,' by J. McMath and L. Parker; 'Perfumes,' by E. M. Wentworth; 'Humane Education,' by C. E. Hurren; and 'Is Electric Anaesthesia Genuine?' by C. W. Hume. Chapter V is devoted mainly to a series of articles on animal welfare progress in foreign countries. There is also a useful series of critical reviews on recent books dealing with animals. The U.L.A.W.S. deserves the support of all naturalists in its aim 'at diminishing . . . the sum total of pain and fear inflicted by man on animals.'

Every Garden a Bird Sanctuary, by **E. L. Turner**, pp. 190, with 7 plates and 12 text figures. (Witherby), 5/-. Miss Turner here presents a sane case for the preservation of wild birds and shows how all may contribute to this desirable end. It must be a very small garden where birds cannot be attracted by one or other of Miss Turner's very straightforward methods, which include various feeding arrangements and easily constructed nesting-boxes. Those who are seeking to attract the birds to their gardens would do well to invest in this useful book.

Wild Life Studies, by **Frances Pitt**, pp. 190, with 9 pen drawings by G. E. Collins. (Nelson), 3/6. Here are 20 very well-written essays dealing with the wild creatures which Miss Pitt has watched so closely with the eye of the true naturalist, and about which she always writes so charmingly. The creatures dealt with include the Long-eared Bat, Bankvole, Shrew, Dormouse, Mole, Hedgehog, Weasel and Badger, Starlings, Peregrine, Falcon, Peewit, Kestrel, Tits and the Barn Owl. The nine drawings are really beautiful and the volume, which is one of Nelson's 'Argosy Books,' is very daintily produced.

Ethics of Egg-collecting, by **Eric Parker**, pp. 120+iv, published by *The Field*, 5/-. It is very disturbing and depressing to think that in spite of protective legislation, egg-collectors are still a grave menace to the wild birds of this country. In our opinion the Editor-in-Chief of *The Field* states the case against them with complete conclusiveness. This small volume summarises a correspondence which has been carried on for a year or two in the columns of *The Field* and any impartial reader of Mr. Parker's carefully reasoned examination of all the statements on both sides will surely agree that the egg-thief ought to be locked up. We read of well-known collectors taking *every clutch* found in a season of the eggs of comparatively rare species, and then declaring that egg-collecting has no effect on bird population. Some collectors argue that the eggs are taken for 'scientific reasons,' but not one of these gentlemen has ever attempted to tell us what is the scientific value of a collection of empty egg-shells. What is to be done about it? Mr. Parker closes his book with some excellent suggestions and in particular urges a stricter enforcement of existing laws. *Ethics of Egg-collecting* ought to

be available for the members of all naturalists' societies and it should be in every school library.

Microscopic Objects, by Jean C. Johnson, pp. viii+144, with 19 illustrations. (The English Universities Press), 3/6. This small volume covers quite a lot of ground, dealing with the preparation of objects and sections for the microscope, and ranging from insect mounting to the preparation of rock and metal sections. The methods employed are sound and up to date. Reagents and apparatus are fully dealt with and the use of the microtome is carefully explained. The book should be of real use to the beginner in microscopy and it is very good value for the money.

The Teaching of Biology, by M. E. Phillips and L. E. Cox, pp. viii+155, with 8 illustrations in text, 4/6. (University of London Press, Ltd.) The aim of this book is to give the teacher a psychological basis for his work and to stress the value of first-hand observation and the part that is played by interest. Section I deals with the general principles that underlie biological teaching; Section II with general method. At the end of the book are a series of suggested schemes of work for children of different ages. For those in search of sound advice on the special technique of biology teaching, it can be strongly recommended. Young inexperienced biology teachers should find it invaluable.

NEWS FROM THE MAGAZINES

The Entomologist's Record for October contains 'The Geographical Aspect of Argentine Entomology,' by K. J. Hayward; 'On the date of the Preface to Hubner's "*Sammlung euroaipscher Schmetterlinge*,"' F. J. Griffin; 'An account of my studies in the biology of *Pieris rapæ*, III,' by O. Querci; numerous notes on collecting including 'List of species of Microlepidoptera, added to the British list since the publication of Meyrick's revised Handbook,' by T. B. Fletcher (*Eupista vacciniella* H.S., recorded from Buttermere); 'Current notes and short notices,' and supplements; 'The British Noctuae and their varieties,' by H. J. Turner; and 'Butterflies of the Upper Rhone Valley,' by R. Verity.

The Essex Naturalist, Volume XXV, Part 1 (April-Sept., 1935) contains: 'Essex Pre-ornithology' and 'The History of Essex Heronries—Additional Colonies,' by W. E. Glegg; 'Three New Records of Mycetoza for Essex,' by G. Lister; and 'The Evolution of the Coastal Drainage of Essex,' by Rupert Coles.

The Proceedings and Transactions of the Liverpool Biological Society, Vol. XLVIII, Sessions 1933-35, contains some valuable notes on the Peregrine Falcon, being extracts covering a long period of years from the diary of the late Professor Kennedy Orton. Some other useful contributions are: 'Growth of the Young Lobster,' by W. C. Smith; 'An Experiment in Lobster Rearing,' by W. C. Smith and T. N. Cregreen; and 'The Fauna of the Liverpool Bay Shrimping Grounds,' by James H. Fraser.

The Entomologist's Record for September contains 'Cornish Notes for 1934,' by C. Nicholson; 'Notes on a Visit to Northern Natal and Zululand,' by J. S. Taylor; 'Noctuae and vars. in 1934,' by A. J. Wightman; 'A few Orthoptera from Yorkshire,' by M. Burr (including *Metriopectera roeselii*, most northerly record, two males from the Humber shore, T. Stainforth, and *Anisolabis annulipes*, very common on dock wastes at Hull); 'Scientific Notes and Observations'; 'Notes on Collecting, etc.'; 'Current Notes and Short Notices'; and supplements 'British Noctuae,' by H. J. Turner, and 'Butterflies of the Upper Rhone Valley,' by R. Verity.

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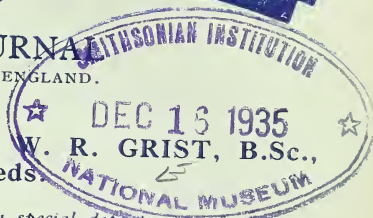
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November, 1935.

The NATURALIST

A MONTHLY
ILLUSTRATED JOURNAL
PRINCIPALLY FOR THE NORTH OF ENGLAND.

Edited by
W. H. PEARSALL, D.Sc., F.L.S., and W. R. GRIST, B.Sc.,
The University, Leeds.



with the assistance as referees in special departments of

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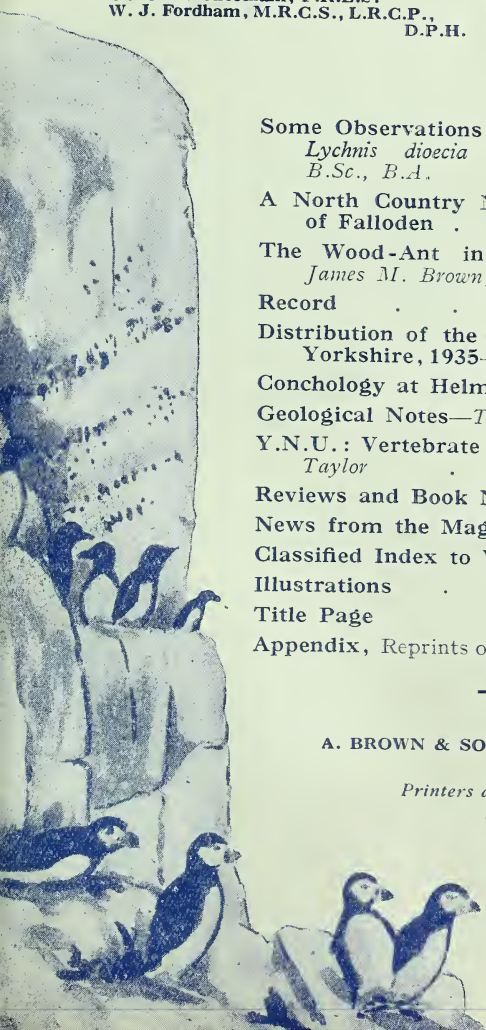
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SOME OBSERVATIONS ON THE RATIO OF THE SEXES IN *LYCHNIS DIOECIA*

HAROLD BARNES, B.Sc., B.A.

WHILE considerable attention has been paid to numerical relationships in animal communities, little work has been done on these lines in plant ecology. The present paper is an account of some field work on the relative numbers of male, female, and hermaphrodite plants of *Lychnis dioecia*.

Some work has been done on this problem and that part of it relevant to this work may be briefly summarised. Strasburger¹ found that in every case the hermaphrodite plants were affected by the smut fungus *Ustilago violaceae*, and as he found on some of the diseased plants non-infected female flowers he assumed the hermaphrodites to be female flowers which had been so influenced by the fungus as to produce stamens. For the ratio of females to males he obtained 1.2 to 1, and 1.4 to 1. Shull² has carried out numerous experiments, using true non-infected hermaphrodites, which are very rare, and has come to the conclusion that it is the male which is heterozygous. However, if Strasburger's results are correct, each flower must possess male and female potentialities.

Shull's ratios were 1.32 females to 1 male. The average of these ratios gives 57 per cent. females to 43 per cent. males.

The results just quoted have been obtained from careful laboratory experiments—mainly with a view to elucidating the problem of sex inheritance. It must be emphasised that this investigation was an attempt to ascertain the relations under natural conditions.

The method adopted was to choose four areas, and to make several visits to each area, collecting each time every flowering shoot. They were then taken back to the laboratory, inspected and counted. It was necessary to proceed in this manner, since it would be impossible to isolate each individual plant

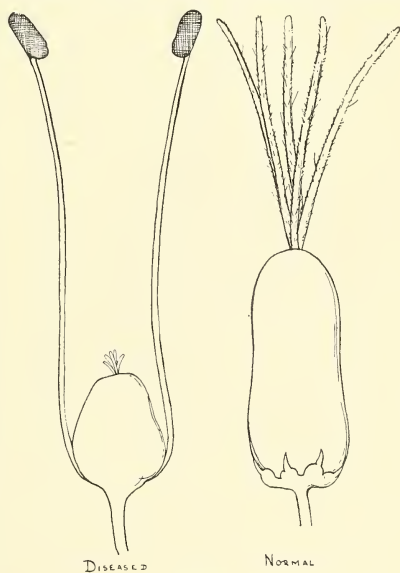


Fig. 1

from its natural surroundings. If, as may be assumed, each type of plant, on the average, produces the same number of flowering branches, the percentages obtained will be the same as if the individual plants had been counted.

The complete results are given in the table (Fig. II), while the percentages for each collection in the four areas are shown

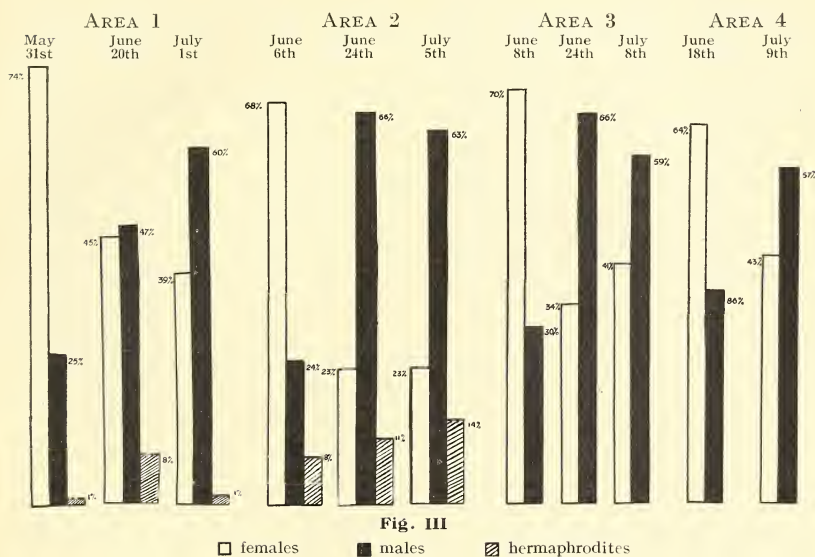
Area	Date	Staminate	Pistilate	Hermaphrod	Total
1	May 31	1,492	506	28	2,026
	June 20	1,278	1,372	176	2,826
	July 1	1,009	1,654	112	2,775
	Total	3,779	3,532	316	7,627
2	June 6	1,509	525	172	2,206
	June 20	606	1,715	268	2,589
	July 1	108	290	63	461
	Total	2,223	2,530	503	5,256
3	June 8	1,143	498	0	1,641
	June 24	350	678	5	1,033
	July 8	367	521	0	888
	Total	1,860	1,697	5	3,562
4	June 18	544	399	0	943
	July 9	106	140	0	246
	Total	650	539	0	1,189
	Total	8,512	8,298	824	17,634

Fig. II

in the diagrams (Figs. III and IV), as well as the final percentages. From the first four diagrams it will be clear that the male plants flower before the female plants. This is in agreement with the protandrous condition found in many of the Carophyllaceæ. The percentage of the hermaphrodites, with one exception, increased with time, which tends to support Strasburger's hypothesis that they are derived from females. It must be noted that the hermaphrodites are with four exceptions diseased plants, and incapable of producing fruits (Shull terms them pseudo-hermaphrodites). On examining the total percentages it is seen that only in one area (Area 2), were the females in excess of the males, and even

in this case the ratio did not reach that of Strasburger and Shull. It might be noticed that if the hermaphrodite percentage is added to the female percentage in Area 2, it gives 42 per cent. males and 58 per cent. females—a close approximation to the figures of Strasburger and Shull. This is also in favour of Strasburger's hypothesis. It would seem however, that either the seeds which are potential male plants are less virile than the potential females, or that some other factor, under field conditions, reduces the number of males.

In addition it was noticed that in the diseased hermaphrodites the ovary is flattened, and the styles poorly developed,



in comparison with the normal females—as shown in the accompanying diagram (Fig. I). If Strasburger's hypothesis is correct it would seem that the fungus not only promotes the growth of the stamens, but retards the growth of the ovary.

No example of a non-infected flower on an infected plant was observed, but there were numerous infected plants with only stamens. The acidity of the soil in each area was pH 7.0-7.5. All the infected plants seemed incapable of producing fruits.

During the investigation it was noticed that the disease appeared most prevalent in the areas where the plants were most crowded.

While this work was being carried on, one small area of *L. vespertina* was investigated, and the results may be briefly

given. Out of a total of 381 flowering stems, there were 171 females and 207 males—*i.e.* 46 per cent. females and 54 per cent. males. Not a single hermaphrodite flower was found. All the flowers on each stem were examined and each stem bore flowers of one kind only.

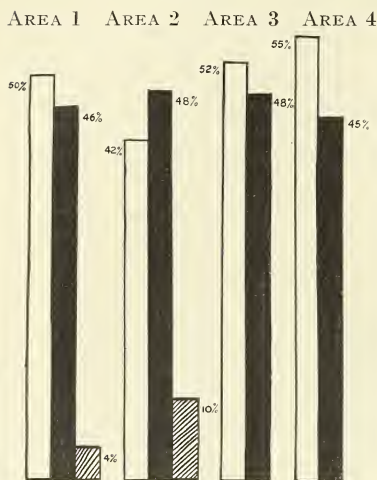


Fig. IV

The percentages, it will be noticed, show a close similarity to those for *L. dioecia*. The percentages of individual flowers (which was not ascertained for *L. dioecia*) were not the same as those for the plants, since out of a total of 3,398, 2383 were male and 1,015 were female, giving 30 per cent. female and 70 per cent. male, or 12 male flowers per stem, and 6 female flowers per stem. As only 381 stems were counted, compared with 17,634 of *L. dioecia*, these results are only tentative.

I should like to express my thanks to R. I. Wood and

L. Rendel-Baker of Ashville College, Harrogate, for the help they have given me in collecting and counting the flowers.

REFERENCES

- 1 Strasburger. *Biol. Centrab.*, 10-1910, five papers.
- 2 Shull. *Bot. Gaz.* 49, 1910, 110, and 52, 1911, 329.

A NORTH COUNTRY MEMORIAL TO VISCOUNT GREY OF FALLODEN.

THE late Viscount Grey was President of the Natural History Society of Northumberland, Durham, and Newcastle-upon-Tyne, and it was his wish that the Hancock Museum at Newcastle, which is maintained by the Society, should have a much-needed endowment fund. Now that Viscount Grey has gone before the scheme could be developed, Lord Armstrong, as Patron and President of the Society, has launched an appeal for funds to found a Memorial Endowment Fund, the income from which will be used for the Museum.

It is proposed also to erect a memorial tablet to Viscount Grey in the museum building, and a total sum of £20,000 to £30,000 is aimed at. All North Country naturalists are invited to contribute to this very worthy appeal. Contributions may be sent to Lord Armstrong at the Hancock Museum, Newcastle-upon-Tyne.

THE WOOD-ANT IN NORTH-EAST DERBYSHIRE

JAMES M. BROWN, B.Sc., F.L.S., F.R.E.S.

THE Wood or Horse-ant (*Formica rufa* L.), though absent from many parts of the country, is quite abundant in many of the smaller woods in North-east Derbyshire, and this is especially so in the Padley Wood, near Grindleford, and in the adjoining Longshaw Estate, now the property of the National Trust.

During an attempted survey of the nests here, a small portion of the Padley Wood, stretching alongside the path for about a quarter of a mile, and reaching inwards for perhaps 80 yards, was worked over on 25th May, 1925. This part of the wood is rough ground bordering the moor, and occupied largely by oak and birch, with a ground flora of ling, bilberry, crowberry, and in places bracken. Fifty-two nests showing activity were located, together with several apparently abandoned. These were almost entirely confined to the wooded areas, one or two only being on the exposed moor itself. The ground being mainly occupied by heathy plants, many of the nests arose from the midst of active bilberry clumps.

To determine if possible the degree to which nests multiply owing to the natural growth of the colonies during a season, the same area was again worked over on 18th October, when 64 nests were noted, giving an increase of 12. (Allowance must be made for the possibility of one or two nests being overlooked on such rough ground.) Most of the new nests were small (about half a yard in diameter), or very small (up to about nine inches in diameter), and only two were of moderate size (*i.e.* about a yard in diameter).

Assuming an average-sized nest contained approximately 20,000 ants (a very low estimate), we should have in this small section of the wood an ant population approximating a million (and probably very much greater than this).

In the adjoining Longshaw Estate, where the ground is more open, the nests are, in places, much crowded. Three such crowded areas measuring 14 yards by 25 yards, 20 yards by 25 yards, and 18 yards by 7 yards, were roughly marked out on 11th October. A count of the nests within these areas gave 30, 30 and 20 respectively. That is, within an area of roughly 1,000 square yards there were 80 nests. These were of very various sizes, the largest measuring a yard across, while many were small or very small. These large numbers of nests in such confined spaces do not appear to be the result of the normal growth and splitting up of the colonies (some

of the smallest would no doubt be due to normal overflow late in the season), but are more likely the result of 'accidental' splitting of communities due to the destruction of the original nests, several such wrecks being obvious.

A simple calculation again suggests the enormous number of ants around here, and one cannot wonder at the dearth of other ground insects.

In this part of the Estate the nests occupied the more open ground and were not, as in the Padley Wood, in the shelter of the trees, and owing to the proximity of scots fir, the mounds were built largely of pine needles, while in those regions of Padley Wood bordering the moor where oak and birch abound, the mounds were constructed mainly of bits of bilberry stem, immature catkins of birch, portions of ling and small twigs and leaves. The largest nest I have noticed on the Estate was almost two yards across.

The earliest date this season (1935) when active ants of this species were noticed hereabouts, was 25th March, and on 18th October, most of the nests showed greater or less signs of activity, and in one case pupæ were still being moved, and one naked pupa was observed. On 23rd October, after two or three frosty nights, ants were still in movement, but only on the mounds of the nests, none were seen in the runs between them, and similar activity was still shown on 6th November.

Judging from the appearance of the ground, the Wood-ant is not so plentiful in the Longshaw Estate now as formerly. This may be due in part to disturbance and destruction of the mounds by inquisitive visitors, since the Estate was thrown open to the public several years ago.

RECORD

A FURTHER NOTE ON EMPHYTUS ABDOMINALIS PELET. (HYMENOPTERA-TENTHREDINIDAE)

OUR note on this insect in the November number of *The Naturalist* (p. 249) was unfortunately premature as Mr. Benson continues his remarks on this species in the November *Entomologists' Monthly Magazine* (p. 241), where it is stated that the true *E. serotinus* does not occur in Britain. Presumably therefore, our old records for *E. serotinus* are all referable to *E. abdominalis*.—W. D. HINCKS and J. R. DIBB.

DISTRIBUTION OF THE CRAYFISH (*ASTACUS PALLIPES*) IN YORKSHIRE, 1935

SYDNEY H. SMITH, J.P., F.Z.S.

RIVER YORE AND TRIBUTARIES : Crayfish were seen in the upper reaches of the Yore and in the River Bain. They are very numerous in Lake Semmerwater.¹

RIVER SWALE AND TRIBUTARIES : There are no new records this year to add to previous notes.

COD BECK : Previous records have been verified.

RIVER AIRE AND TRIBUTARIES : Crayfish were seen in the Otterburn Beck near Bell Busk. When netting by the Yorkshire Fishery Board at Malham Tarn in March, Inspector R. W. Ward states that Crayfish were seen, and he also saw many claws and parts of dead Crayfish round the margins of the Tarn.

RIVER WHARFE AND TRIBUTARIES : Inspector Ward informs me that Crayfish were observed in the main river at Burley-in-Wharfedale. Crayfish were also seen during February in the Riffa Beck, which is a small tributary that enters the Wharfe on the left bank between Pool and Castley.

RIVER NIDD : No reports.

LEEDS AND LIVERPOOL CANAL : Crayfish were again seen near Skipton.

RIVER DERWENT : Previous localities have been verified but there are no additional notes.

LAKE GORMIRE : Crayfish are again quite plentiful.

RIVER RYE : There is no trace of Crayfish that have been introduced here.

I am again indebted to Inspector R. W. Ward, of the Yorkshire Fishery Board, for his help in obtaining notes.

¹ There is a record on page 308 of *The Naturalist* for October, 1914 ('Yorkshire Natural History 200 years ago,' by Thomas Sheppard, F.G.S.), and quoted from an old publication, *Magna Britannia et Hibernia*, dated 1731, Vol. VI, of which contains descriptions of the counties of Westmorland and Yorkshire which gives particulars of the stocking of Pool Semur (Semmerwater) with Crayfish from the south of England by Sir Christopher Medcalfe, where the species still exists, as was recently proved on an excursion of the Yorkshire Naturalists' Union.

This note implies that Crayfish did not exist in Yorkshire prior to 1731, and it would be of great interest if any reader of *The Naturalist* could supply authentic information of any records of the Crayfish in Yorkshire prior to that date.

CONCHOLOGY AT HELMSLEY

ELSIE M. MOREHOUSE

DURING the Meeting of the Yorkshire Naturalists' Union, at Helmsley, in the first week in September, I was able to observe the following molluscs, and wish to thank the members for their help in gathering species which came under their notice. If one keeps more or less with the main party it is not possible to give more than a very hasty search here and there for the smaller helices. Helmsley and district is certainly rich in its molluscan fauna. It was a real joy to a conchologist and it should provide great possibilities for future investigation.

For the convenience of printing, I will number the localities after the species as follows :

1. Duncombe Park and Woods.
2. Rievaulx Abbey and Woods adjoining the Terrace.
3. Beck Dale Woods.
4. Riccall Dale Woods.

With the exception of *L. maximus* L., all the slugs I saw were very young indeed ; this might be due to the late breeding season owing to the drought.

The following were the molluscs observed :

Limax maximus Linné, 1.
Vitrina pellucida Müller, 2.
Vitrea rogersi B. B. Woodward, 1.
V. nitidula Drap, 2.
V. alliaria Miller, 3, 4.
Helicella virgata Da Costa, 2.
H. caperata Montagu, 2.
Hygromia fusca Montagu, 1, 3.
H. granulata Alder, 1, 3.
H. rufescens Pennant, 1.
H. hispida Linné, 2, 3, 4.
Pyramidula rotundata Müller, 1, 2, 4.
Jaminia cylindracea Da Costa, 1, 2.
Arianta arbustorum Linné, 1, 2, 3.
Helix hortensis Müller, 1, 2.
H. nemoralis Linné, 3.
H. aspersa Müller, 2.
Cochlicopa lubrica Müller, 3.
Clausilia laminata Montagu, 1, 2, 3, 4.
C. bidentata Ström, 1, 2, 3, 4.
Ena obscura Müller, 1, 2, 3.
Carychium minimum Müller, 1.
Euconulus fulvus Reinhardt, 1, 4.
Acanthinula lamellata Jeffreys, 1.
Punctum pygmaeum Drap, 1.

Another record for the district was made by Mr. A. Smith, of York, later in September ; it should be added to the above list, that is *Helicigona lapicida* Linné, on the walls in the village of Rievaulx.

Science Progress for October (Arnold 7/6) contains articles of interest to naturalists as follows : ' Selections from the Story of Plant Migration revealed by Fossils,' by A. C. Seward ; ' The Interpretation of Animal Behaviour,' by Dr. J. A. Bierens de Haan ; ' Do Birds Attack Butterflies? ' by L. Richmond Wheeler.

GEOLOGICAL NOTES

T. SHEPPARD, M.Sc., F.G.S.

OF especial interest to our readers are two papers, illustrated by maps and photographs, appearing in the *Proceedings of the Geologists' Association* recently issued. They are 'The Geology and Topography of the Limestone Knolls in Bolland (Bowland), Lancs. and Yorks.,' by D. Parkinson; and 'Structural Geology of Stainmore, Westmorland, and Notes on the late Palæozoic (late Variscan) Tectonics of the North of England,' by J. S. Turner.

J. K. S. St. Joseph gives a well-illustrated 'Critical Examination of *Stricklandia lirata*' in *The Geological Magazine* for September.

Mr. H. Dewey has been appointed Assistant Director at the Geological Survey in place of Mr. Bernard Smith, who takes charge of the Survey on the retirement of Sir John Flett. Mr. C. E. N. Bromehead, of York, is being transferred to London, a promotion which many of our readers who have benefited from his sojourn in Yorkshire will regret. He will be succeeded by Mr. T. H. Whitehead.

The last two issues of *The North Western Naturalist* contain the following notes of interest to Northern geologists: 'A Split Peat Bed on Pendle Hill,' by J. Walton; 'Geological Reconstruction in the Doncaster Museum,' by Norman Smedley; 'Geologists at Settle,' by T. A. Jones; and 'Prehistoric Remains in East Yorkshire,' by T. Sheppard.

Dr. W. T. Calman's Presidential Address on 'The Meaning of Biological Classification' appears in the *Proceedings of the Linnean Society of London* issued October 10th.

Though rather on the thin side, the *Proceedings of the Yorkshire Geological Society* just issued, edited by R. G. S. Hudson, contains the following important contributions: 'Notes on Jurassic Floras,' by A. C. Seward; 'The Upper Wensleydale River System,' by W. B. R. King; 'The Upper Limit of the Beyrichoceras Zone in the Pendle Hill Area,' by D. Parkinson; 'A Mid-Carboniferous Unconformity in the Skipton Anticline,' by R. G. S. Hudson and H. C. Versey; and 'Bibliography of Yorkshire Geology, 1934,' by H. C. Versey.

With seventy-two illustrations, Vol. II., No. 3, of *Sands, Clays, and Minerals*, a British magazine devoted to economic minerals (obtainable from A. L. Curtis, P.O. Box 61, Chatteris, Cambs., 3/6 post free), contains, among others, the following interesting papers: 'Early English Lead Mining,' by J. E. Metcalfe; 'Quartz Sand in Silica Brick Manufacture,' by P. Budnikoff; and 'Ancient Tin Mining in Cornwall,' by F. B. Michell.

Of more than local interest are two papers appearing in *The Quarterly Journal of the Geological Society of London*, No. 363, namely, 'A New Section of Fossiliferous Upper Cornbrash of North-eastern Facies at Enslow Bridge, near Oxford,' by J. A. Douglas and W. J. Arkell; and 'The Superficial Deposits of the Country North of Stratford-on-Avon,' by Mabel E. Tomlinson.

S. W. Hester and W. Dewar write on 'Plaster Mounts for Exhibiting Fossils' in *The Museums Journal* for October.

The Journal of the British Association issued at Norwich contains abstracts of papers and discussions, including the following of northern geological interest: 'Geological Relations of Early Man in East Anglia,' by P. G. H. Boswell and others; 'Discussion on Geology in Schools'; 'The Conditions of Formation of British Peats,' by Dr. H. Godwin; 'Peat Land Vegetation and Peat Soils in the British Isles,' by H. Osvald; 'Conditions of Peat Formation in the Pennines,' by Dr. H.

Raistrick ; ' The Land Utilisation Survey of Britain,' by Dr. L. Dudley Stamp.

Five of the fourteen addresses appearing in *The Advancement of Science* (222 pages, 3/6), issued by the British Association for the Norwich Meeting, are of great geological value, viz., the Presidential Address of Professor W. W. Watts on ' Form, Drift, and Rhythm of the Continents ' ; and the Presidential Addresses to Section C, ' Some Geological Aspects of Recent Research on Coal,' by H. G. A. Hickling ; Section D, ' The Species Problem,' by F. Balfour-Browne ; Section E, ' Some Aspects of the Polar Regions,' by F. Debenham ; and Section H, ' Recent Progress in the Study of Early Man,' by Sir Arthur Smith Woodward.

In the *Twenty-ninth Report of the Southport Scientific Society* Mr. H. Broderick writes on Martin Mere. He refers to a large erratic and states, ' It is unfortunate that the plate on the limestone boulder here describes the granite boulder as " Shap Granite," as it is really of the Eskdale series, and no boulders of the Shap area have been found in the N.W. of Lancashire, the trend of the glaciers having carried them into the Yorkshire Dales and the great Plain of York.' And later, ' Two fine bronzes were found at the same time, both of which were very fine specimens and probably dated from Roman times.' Judging from the illustration these are clearly of the Bronze Age, and much earlier than Roman.

The Abstract of the Proceedings of the Geological Society of London is a useful form in which to get summaries of the various papers read before the Society, and the discussions. The various proceedings distributed to the Fellows from time to time are bound up in this handy form.

An illustrated account of the New Museum of Practical Geology appears in *The Quarry and Roadmaking* for August.

Part I of *The Summary of Progress of the Geological Survey of Great Britain* and the Museum of Practical Geology for the year 1934 contains, among others, the following district reports on the work accomplished during the year : Yorkshire District, by C. E. N. Bromehead ; Lancashire District, by W. B. Wright ; Cumbrian District and Forest of Dean, by T. Eastwood ; and Northumberland and Durham District, by R. G. Carruthers.

YORKSHIRE NATURALISTS' UNION

VERTEBRATE ZOOLOGY SECTION.

A MEETING of the Vertebrate Section of the Yorkshire Naturalists' Union was held in the library of the Church Institute, Leeds, on Saturday, October 19th, Alderman A. Hirst occupying the Chair.

The Sectional Meeting was preceded by meetings of the Yorkshire Wild Birds and Eggs Protection Acts Committee and of the Yorkshire Mammals, Amphibians, Reptiles and Fishes Committee.

At the Sectional Meeting the minutes of the previous meeting were read and confirmed as also were the Annual Reports of the Divisional Officers of the North, East and West Ridings and of the York districts. The Divisional Officers were Messrs. W. J. Clarke, C. W. Mason, H. B. Booth and S. H. Smith.

The General and Financial Reports of the Yorkshire Wild Birds and Eggs Protection Acts Committee and of the Yorkshire Mammals, Amphibians, Reptiles and Fishes Committee were read and approved.

Alderman Alfred Hirst was re-elected President of the section for

1936, and the name of Mr. R. Chislett was forwarded to the executive as the Section's nominee for the Presidency of the Union.

Mr. C. F. Procter exhibited the skin of a young male Marsh Harrier which was shot near Leven in the late summer of this year.

Mr. W. J. Clarke gave an illustrated lecture entitled 'British Reptiles and Batrachians,' and first referred to the rare occurrence of the Logger Headed and Hawks-bill Turtles in the North Sea. The lecturer stated that the former existence of land tortoises in this country was proved by the fossil remains.

The Lizards were next described and the power of casting the tail referred to. When this takes place the old tail is replaced by a new one which is generally short and stumpy. On rare occasions two new tails may replace the original and a slide was shown illustrating this abnormal growth. Photographs of the Viviparous Lizard, the much more local Sand Lizard and of the Slow Worm were shown, as well as examples of tropical species that had found their way into the country in consignments of foreign fruit.

The Adder and Grass Snake were next described and in the case of the former the mechanism of the poison fangs was indicated. X-Ray photographs revealed the arrangements of the ribs which allowed great distension of the body when prey was swallowed and enabled the reptile to glide quickly over a rough surface. Photographs were shown of the Adder changing its skin and of the rare Smooth Snake which feeds principally on Lizards.

The metamorphosis of the Frogs, Toads and Newts was illustrated by a series of photographs tracing their development from the egg, through the tadpole stage to the adult creatures. The Natterjack Toad was described as much more local in its distribution than the Common Toad and much more active and vocal in its habits. Of the Newts the rare Palmated, the Smooth and the Great Crested were all shown on the screen and the lecturer explained that they were no more aquatic in their habits than the Common Frog or Toad and that like them they resorted to water in order to perpetuate their kind. The tadpole stage of the Great Crested Newt may continue for two years.

The lecturer described various forms of Toad and Lizard charms used for keeping away witches and regarded as a cure for Bronchitis. Such charms are found in various parts of the world and even in parts of Yorkshire. *

On one occasion the lecturer was bitten by an Adder and though surgical aid was forthcoming he suffered from faintness and nausea. Grazing sheep and horses are sometimes bitten on the nose and the swelling of the mouth and nostrils sometimes leads to suffocation and death.

Mr. J. R. Edwards showed a cinematograph film entitled 'The Sewage Farm,' and stated that he had read that bird photographers did harm by causing wild birds to desert their nests and young. By selecting a sewage farm and concentrating his energies on feeding birds he hoped to escape this charge.

The subjects were birds feeding in and around the settling ponds and in the spring months the search for food did not prevent time being given up to courtship and display. The courting display of the Redshank has been described by the lecturer in *The Naturalist*, for November, 1935, and all the phases there described were clearly shown in motion pictures. Many other species such as the Black-headed Gull, Meadow-pipit, Pied-wagtail, Lapwing, Waterhen, Reed-bunting, Starling and Dunlin were shown.

The lecturer was also fortunate in obtaining close-up photographs

of the Reeve and Wood Sandpiper as they waded about picking up food here and there from the surface of the water.

Photographs were also shown of newly-arrived Swallows huddled together on the telegraph wires during a heavy fall of snow and of a Short-tailed Field-vole feeding and cleaning himself.

Mr. F. H. Edmondson showed a length of cinematograph film entitled 'Among the Pygmies of the Itura Forests.' The subjects included a large nesting colony of weaver birds, a school of Hippopotami enjoying themselves in the river and a unique herd of trained African Elephants working under native direction.

The film dealt principally with the habits of the Pygmies of this part of the Belgian Congo and illustrated their method of climbing the giant trees. The building of a native hut was shown in all its stages and the curious tribal dances were re-enacted.

Hunting is done with bows and arrows and the food consists of flesh, fruits, roots and fungi. During the five days that the lecturer lived among the natives he did not enquire too closely into the ingredients of the strange dishes that were set before him.

Fly fishing was indulged in from a native dug-out canoe and strange fish full of strange bones were caught and eaten.

Finally a vote of thanks to the lecturers and the lanternists was proposed and carried unanimously.

E. WILFRED TAYLOR

REVIEWS AND BOOK NOTICES

An Aviary on the Plains, by Henry G. Lamond, pp. viii+228. (Angus & Robertson), 6/-. Mr. Lamond is a well-known Australian nature writer, and this book gives an entertaining, chatty account of the most important and interesting birds to be found on the plains of North-East Australia. The 46 articles are interesting reading for the bird-lover, even though he will never be fortunate enough to visit the Antipodes.

Bird Wonders of Australia, by A. H. Chisholm, pp. viii+300, with 58 illustrations. (Angus & Robertson), 6/-. Australian wild life offers many strange and interesting problems for the naturalist, and Mr. Chisholm has here presented a large number of curious facts about the birds of his country. Some of his chapter headings will give a good idea of the line he takes: Birds that steal human hair; birds that bury their eggs; birds *versus* snakes; feathered players and dancers; why birds dress up. The writer's style is both entertaining and scientific and the book can be thoroughly recommended to naturalists.

Grey Owl and the Beaver, by Harper Cory and Grey Owl, pp. 140, with 8 illustrations. (Nelson), 2/6. By this time most of our readers will know of Grey Owl, the Red Indian naturalist who has been lecturing in this country during the present winter. He is a remarkable man, and he has done a great work in educating the public on the importance of the preservation of the wild life of North America. Mr. Harper Cory, himself a Canadian naturalist, here tells us Grey Owl's life story, and it is one of great interest and full of variety. Grey Owl himself contributes chapters on wild life at home, and on the beaver.

The Naturalist

Insect Wonders of Australia, by **Keith C. McKeown**, pp. xii+252, with 31 illustrations. (Angus & Robertson), 6/-. This is a most fascinating book. The writer is assistant entomologist of the Australian Museum, and he knows how to present astonishing and remarkable facts in a lucid and pleasant way. Any naturalist, and especially the entomologist, who begins this book, will not wish to put it down until he has read it from cover to cover. Mr. McKeown's discussion of insect instinct shows not only a first-hand acquaintance with the subject but exceptional ability in presenting the facts and reasonings in a convincing and readable manner.

[NOTE.—All three books mentioned above are marketed in England by The Australian Book Co., 37 Great Russell Street, London, W.C.1.]

Sea-gulls in London, by **Seton Gordon**, pp. 90, with 69 illustrations. (Cassell), 7/6. Mr. Gordon here presents us with a fine series of bird photographs illustrating some short but useful notes on the four species of gulls which may be seen in the London area during the winter months. Londoners are used to the 'sea-gulls' now, but it is not everyone who can distinguish them at sight. The commonest of them is, of course, the back-headed gull, but there are also the common gull, herring gull, and, very occasionally, the greater and lesser black-backed gulls. Mr. Gordon's beautiful book should be of great assistance to those who watch the birds on the Thames Embankment or by the Serpentine.

Nature in the Wild. A selection of the world's finest photographs, 96 pages of pictures. (Country Life, Ltd.), 5/-. This magnificent collection of wild life photographs is issued as an illustrated souvenir of the International Exhibition of Nature Photography, held in the Natural History Museum, South Kensington. This Exhibition, which is open free to the public from October 16th to January 18th, was arranged for the purpose of showing the great advances in Natural History Photography, which have been made in recent years. It is an outstanding success. There are on view over 1,200 photographs of birds and mammals, and these include examples from nearly every country in the world. The souvenir under review is a worthy memento of a fine show. The task of selection must have been a difficult one, but we have no fault to find. The pictures are a sheer delight, and if we may be allowed to indicate any special preference it would be for the marvellous photographs of birds in flight taken by Dr. A. Hugo Bernatzig, of Austria.

Birds and the Sea, by **Frances Pitt**, pp. 187, with 31 illustrations from photographs. (Longman's), 6/-. The title of this latest and most welcome book by Miss Pitt is happily chosen. Nowhere is bird life more interesting than by the sea, and the author, who has made a close study of her subject, describes visits to such bird-haunts as Grassholm, Ravenglass, the Farnes, and the northern lochs. As one might expect, the photographic illustrations are very good indeed, and although Miss Pitt has written with the general reader in mind, the experienced ornithologist may read this book with interest and profit.

NEWS FROM THE MAGAZINES

The Entomologist for November contains '*Danaus plexippus* L. in the British Isles,' by C. Nicholson (an important paper. Northern

records are Hawthorn Dene, Durham, September, 1933; Darlington, Durham, September, 1926; Kirkheaton, Yorkshire, September, 1917; Bolton Abbey, Yorkshire, October, 1934; and Nelson, Lancashire, June, 1933); 'Migration Records, 1935,' by Capt. T. Dannreuther (numerous records from the Outer Dowsing Light Vessel, 31 miles E.S.E. of Spurn Point; and records of *Vanessa cardui*, Solway Firth, Carlisle and Isle of Man; *Colias croceus*, Carlisle; *Herse convolvuli*, Penrith, Carlisle and Grange-over-Sands; *Nymphalis antiopa*, Tyne Valley; and *Celerio galii*, Birtley, Durham); 'The Crabtree Collection,' by W.R.-S.; and numerous notes and observations, including 'Notes on Breeding *Eupoecilia affinitana* Douglas,' by A. E. Wright (Bred from roots of *Aster tripolium*, at Grange-over-Sands).

The Entomologist's Monthly Magazine for November contains 'Some new British sawflies, with notes on synonymy, etc. (Hymenoptera Symphyta),' by R. B. Benson; 'Systematic notes upon British aquatic Coleoptera. Part IX. Colymbetes, Dytiscus, Hydraticus, Acilius and Graphoderes,' by F. Balfour-Browne; '*Bagous frit* Herbst. in Britain, with notes on some other species of the genus,' by K. G. Blair; 'Notes on Tortricidæ,' by G. L. Hey; '*Astichus arithmeticus* Forst. and *Aphanogmus fuscipennis* Thoms., two species of Hymenoptera Parasitica from Windsor Forest, new to Britain,' by H. Donisthorpe; 'Notes on British Siphonaptera,' by G. B. Thompson; 'A Note on preliminary work on attractants for cabbage root fly *Hylemyia* (*Chortophila brassicæ* Bche.) and carrot fly (*Psila rosæ* L.),' by J. E. M. Mellor and R. M. Woodman; 'Miscellaneous observations on the biology of *Apanteles glomeratus* L. (Braconidæ),' by A. G. Hamilton; and several shorter notes including 'A Yorkshire locality for *Ameletus inopinatus* Etn. (Ephemeroptera),' by J. M. Brown (Malham, M.W. Yorkshire, June, 1931).

The Transactions of the Society for British Entomology, Vol. 2, Part 2, contains 'Courtship and allied problems in insects,' by G. P. Hale Carpenter; 'Field experiments on the flight of *Notonecta maculata* Fabr. (Hemipt.),' by G. A. Walton (with plate); 'Hemerobiidæ and Chrysopodæ (Neur.) in a light trap at Rothamsted Experimental Station,' by C. B. Williams and F. J. Killington; 'Wegener's theory of the movement of the continents,' by K. G. Blair (with plate); 'Notes on the biology of *Microdon eggeri* Mik. (Dipt. Syrphidæ),' by E. E. Syme (with plate); and 'A Bibliography of entomological notes and papers contained in the serial publications issued by local scientific societies in the British Isles. Part III,' edited by B. M. Hobby (dealing with *The Naturalist*, from 1st May, 1864 to December 1930,' by W. J. Fordham, 66 pages).

The Journal of the Society for British Entomology, Vol. 1, Part 4, contains numerous more or less short articles, including 'Hymenopterous and Dipterous parasites of *Aglais urticae* Linn. (Lep.),' by D. O. Boyd; 'Plecoptera, Neuroptera (s. str.) and Trichoptera, in Banffshire, in May, 1934,' by K. J. Morton; 'Plecoptera and Trichoptera from St. Mary's Loch, Selkirkshire,' by K. J. Morton; 'Male Tabanidæ (Dipt.) in the New Forest, Hants, 1933-34,' by E. R. Goffe (a long paper); 'Notes on the habitat and life-history of *Nathanica* (*Nothochrysa*) *fulviceps* (Steph.) (Neuropt.),' by F. J. Killington (with plate of first instar larva. This species occurs in Yorkshire and Lincolnshire). One note on Ichneumonidæ, six on Lepidoptera and two on Diptera, including '*Sziladynus montanus* Meig. (Dipt. Tabanidæ) in the North of England,' by W. J. Fordham.

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COMPILED BY W. E. L. WATTAM

It is not an index in the strictest sense of that term, but it is a classified summary of the contents of the volume, arranged so as to be of assistance to active scientific investigators ; the actual titles of papers not always being regarded so much as the essential nature of their contents.

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Yorkshire Naturalists' Union.

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The 388th Meeting WILL BE HELD AT HORNSEA

FOR THE INVESTIGATION OF THE

Mere and the surrounding district, including the beach south of Hornsea and from Hornsea to Skipwith northwards.

EASTER WEEK-END
APRIL 19th-22nd, 1935

THE DISTRICT.—Hornsea, with its Mere, the largest sheet of natural fresh water in the county ; its ever-changing cliffs of boulder clay ; the earthworks of Skipsea Brough, where Drogo de Bevere, one of the Conqueror's followers, afterwards erected a keep of masonry ; and the perhistoric lake dwelling at Ulrome ; offers so many attractions that the Union may be excused for making a fourth visit to this interesting corner of East Yorkshire. Previous visits have provided rich lists of birds, beetles, shells and flowers. In West's *Alga Flora* the Mere is often cited, and R. H. Philip has published lists of diatoms from here. One notes the absence of records of mosses and many orders of insects, also particularly ecological facts concerning the flora and there may be some interesting features to be noted although the date is early and geology will be claiming the attention of many members.

BOOKS AND MAPS.—The area is found on Sheet 28 of the 1-inch Ordnance Survey. In *The Naturalist*, 1881, pp. 194-196 ; 1908, pp. 302-310 ; 1926, pp. 277-283 ; will be found interesting accounts of previous meetings, but probably the best account of the Mere is found in the 1913 volume, pp. 33-71, a paper by the late G. Bolam. Other books which may be consulted are *The Flora of the East Riding*, by J. F. Robinson ; *Geological Rambles in East Yorkshire*, by T. Sheppard ; *Birds of Yorkshire*, by T. H. Nelson ; *Alga Flora of Yorkshire*, by W. West ; and *The Geology of Yorkshire*, by Kendall and Wroot.

HEADQUARTERS.—The Marine Hotel, near the Promenade, Hornsea. Terms 10/6 per day. This includes bed, breakfast, sandwiches, and dinner. The accommodation is limited owing to holiday bookings. A number of rooms have been reserved for members making application at once to the

hotel manager; mention should be made that applicants are members or associates of the Y.N.U. There is free parking of cars at the hotel on production of member's card.

RAILWAY FACILITIES.—On Easter Monday trains will run frequently between Hull and Hornsea, but probably not according to current time tables. Members wishing to join main line trains should consult railway company notices.

STATE OF TIDE.—High tide at Hornsea :—

April 20th, 6-57 a.m. ; 7-23 p.m.

„ 21st, 7-28 a.m. ; 8-1 p.m.

„ 22nd, 7-58 a.m. ; 8-36 p.m.

ROUTES.—The President proposes to arrive on Thursday evening and will work the coast north of Skipsea to Bridlington on Friday.

SATURDAY.—Leave headquarters at 2-15 p.m. The general body of naturalists will visit the area of the north side of the Mere under the leadership of Mr. T. Stainforth, B.Sc. The geologists will visit the coast south of Hornsea under the guidance of the President of the Union.

SUNDAY.—Arrangements will be announced at headquarters. The geologists will visit the inland glacial gravel pits in the district.

MONDAY.—The general body of botanists and zoologists will leave headquarters at 10 a.m. to investigate the area on the south and west side of the Mere; Messrs. T. Stainforth, B.Sc., and G. Philip will act as leaders. For late arrivals leaders will be appointed by the Hull Scientific and Field Naturalists' Club. The geologists under the President will start at 9-50 a.m. by bus from the Marine Hotel for Skipsea, and after visiting the earthworks and peat deposits, will work back along the coast to Hornsea.

PERMISSION to visit portions of his estate has been granted by H. M. Strickland Constable, of Wassand Hall.

GEOLOGY.—Our President, Mr. W. S. Bisat, writes :—The boulder clay cliffs which stretch for miles on each side of Hornsea afford an unrivalled opportunity for examining the different beds of the A or drab series of boulder clays. The beds rise gradually northwards, and hence it is convenient to commence an examination at Aldborough, six miles south of Hornsea, where the highest bed of the A series, the grey bed of Aldborough, is seen at the foot of the cliffs, with the B or brown-red series resting on it. This grey bed is packed with erratics, and in it hard white chalk attains a maximum. Liassic limestone with *Gryphaea* and green greywackes are probably also at their greatest abundance in this bed, which contains a good deal of magnesian limestone. On the other hand, igneous rocks, except for a few Cheviot porphyrites and basalts, are distinctly scarce. Beneath this bed there rises a drab bed in a small anticline a few yards south of the road end at Aldborough, with its crest at high-water mark. This drab bed is again seen rising in the cliffs nearer Hornsea, and contains more igneous rocks, halleflintas being especially noteworthy, whilst an occasional pebble of rhomb-porphry may be found. This bed is interesting as being the last one in which black flints occur in any abundance.

North of Hornsea lower beds of the A series are seen with fairly abundant igneous rocks, including granites and quartz-porphry. Beneath these is a brown bed of soft clay with few erratics and *no chalk*, seen under the highest part of Skirlington Hill.

Work already done indicates that there is a large field for research in collecting the distinctive erratics from each bed, and in matching up the igneous erratics, especially the attractive-looking granites. It is thought probable that some of these erratics may be confined to individual beds. The presence of black flints and rolled pebbles of quartz-porphry and rhomb-porphry in the Hesse Clays, taken together with the field relationships, suggests that these well-known clays may belong to the higher part of the A series.

It is probable that good sections in the puzzling green and red colour bands and in the non-colloidal heads to the beds of boulder clay will be seen.

VERTEBRATE ZOOLOGY.—**MAMMALS** :—Full lists will be found in the articles cited in *The Naturalist*, and though Bolam says the Otter was not seen by him, both it and the Badger were added on the 1926 circular and report of excursion.

BIRDS.—Mr. C. W. Mason writes :—Hornsea Mere is one of the bird sanctuaries of the East Riding where the Yorkshire Naturalists' Union Bird Protection Committee provide a watcher during the nesting season. However, this meeting is so early that his duties will not have started, but he will join the party.

The Heronry which started 39 years ago has now about 20 nests. It is situated at the west end near the Rookery. The Great Crested Grebes should be seen in good numbers, as last year 20 pairs nested. Coots are also in large numbers. Ducks are plentiful and the following should be seen : Mallard, Teal, Pochard, and Tufted Duck. The Kingfisher is here, the Water Rail nests regularly, as also the Snipe and Woodcock. The Tawny Owl will be seen in the woods, and the Little Owl has been here for 12 years. Of the smaller birds the Sedge and the Reed Warblers are the most common, Reed Bunting, Long-tailed Tits, Pied and Yellow Wagtail, Swallow, Martin and Cuckoo may be seen, and the Cormorant is here all the year round. The vermin pole of the keeper is worth an inspection, as it is on this pole the Common Wren has nested for three years in the carcasses of the Kestrel and Carrion Crow as reported by Mr. C. F. Procter.

CONCHOLOGY.—Mrs. Morehouse writes :—Hornsea and the surrounding districts are rich in its molluscan fauna, many of the land and freshwater species are the same which were found many centuries ago. This is proved by the peat beds which appear on the shore below the station and at Skipsea. The Rev. F. H. Woods published a list of forty marine species, and the following comprise the non-marine found by W. D. Roebuck and Greevz Fysher in 1881, 1900, 1908 and 1926. *Agriolimax agrestis* var. *reticulata*, *A. agrestis* var. *albida*, *A. laevis* var. *intermedius*, *Arion hortensis* var. *nigra*, *Vitrea crystallina*, *V. alliaria*, *V. pura*, *V. nitidula*, *Eucomilus fulvus*, *Hygromia hispida*, *H. granulata* var. *cornea*, *H. rufescens*, *Pyramidula rotundata*, *Vertigo antiwertigo*, *Sphyradium edentulum*, *Acanthinula aculeata*, *Arianta arbustorum*, *Helix aspersa*, *H. aspersa* var. *nigrescens*, *H. nemoralis*, *H. hortensis*, *Theba cantiana*, *Cochlicopa lubrica*, *Helicella itala*, *H. itala* var. *alba*, *H. virgata*, *H. virgata* var. *hyalozona*, *Succinea elegans*, *Sphaerium corneum*, *S. lacustre*, *Anadonta cygnea*, *Bithynia tentaculata*, *B. tentaculata* var. *decollata*, *B. leachi*, *Valvata piscinalis*, *V. cristata*, *Planorbis spirorbis*, *P. vortex*, *V. complanatus*, *P. contortus*, *P. carinatus*, *P. corneus*, *P. albus*, *P. nautilius*, *Physa fontinalis*, *Limnaea pereger*, *L. pereger* var. *ovata*.

ENTOMOLOGY.—Mr. T. Stainforth, B.Sc., writes :—Previous circulars and reports of the Union's visits to Hornsea give a fairly complete account of the beetles of the Mere. Three-quarters of a century ago a coleopterist named W. K. Bissill visited this area and discovered *Oodes heliopioides* and *Chlœnius nigricornis*, and states that *C. holosericeus* is said to have been taken. Should these species still occur they are most likely to be found under piles of cut reeds and sedges at the west end of the Mere. Special attention should be given to aquatic coleoptera, which at this season should be abundant.

It will be rather early for other orders of insects, but Bolam noted that midges are a feature of the place, flying over the tops of the trees in dense smoke-like columns. He says at least two species of mosquitoes are a bane to one walking in the woods.

At the time he was there it was a poor season for Lepidoptera, but he notes *Hemerophila abruptaria*, Small Elephant Hawk Moth, Gold Spangle, Twin Spot Carpets, Swallow-tailed Moth, Gold-tail, Woodswift, Goldswift and Humming Bird Hawk Moth. He also says the Willows are bored by one of the large *Sesia* larvae ; probably *S. bembeciformis*.

ARACHNIDA.—A good list of species obtained at the Mere will be found on p. 307 of the 1908 *Naturalist*, where Rev. O. Pickard Cambridge, F.R.S., writes that *Tmeticus affinis* Bl. was the most interesting, as Blackwall's original type specimens came from here.

BOTANY.—Mr. T. Stainforth, B.Sc., writes :—Botanically the Hornsea Mere area is distinctly rich, but at an excursion held so early in the year and so near the sea coast very little in the way of flower life can be expected.

The types of habitat that may be studied here are four : (1) the gravelly ridges, particularly on the south side of the Mere ; (2) the reed beds and open marsh ; (3) the damp woodland at the west or Wassand end ; (4)

the open waters of the Mere. If the season is well advanced certain of the 'batrachian' species of *Ranunculus* and *R. hederaceus* may be flowering; *Caltha palustris* will make a fair show. On the gravelly ridges will be found *Cardamine hirsuta*, *Erophila vulgaris*, and *Viola sylvestris*.

Botrychium and *Ophioglossum*, which occur here, will be scarcely discoverable at this time. *Daphne Laureola* will be blooming in the hedgerows at the Wassand end of the Mere. *Ranunculus lingua* will be represented by its submerged leaves, under which, on the last visit of the Union to this locality, were numerous colonies of *Hydra viridis*. In Bolam's notes there is a reference to *Peucedanum palustre*, but this is probably an error in determination.

MYCOLOGY.—Mr. C. Crossland gives a full list of species on pp. 309-310 of 1908 *Naturalist*. He has the following Mycetozaa from rotting wood there: *Stemonitis typhina*, *S. Friesiana*, *Perichæna corticalis*, *Lycogala epidendrum*, *Chondrioderma difforme* and *Ceratiomyxa mucida*.

LICHENS.—Mr. W. E. L. Wattam gave a good list of species and their particular habitats in the report of the 1926 meeting.

MICRO-FLORA.—Mr. Graham Philip writes:—In between the 'rises' of the plain of Holderness formerly existed many meres—the remains of a melted ice-sheet. One of these remains in Hornsea Mere, now the largest expanse of fresh water in Yorkshire, and exposures on the coast still exhibit lacustrine deposits of the past. Among the peat and tree remains of the latter, near Hornsea, are found the flinty skeletons of Diatoms. It is remarkable that many of these minute fossil plants have representatives of the same genera and even species in the Mere to-day. The following are common to the peat and the Mere: *Pinnularia major* (Kutz.) Grun., *Navicula cuspidata* Kutz., *Pleurosigma acuminatum* (Kutz.) Grun., *P. Spencerii* var. *Smithii* Grun., *Epithemia turgida* (Ehr.) Kutz. var. *granulata*, *E. zebra* (Ehr.) Kutz.

Many of the peat diatoms are characteristic of Sphagnum bogs or benthic lake flora, but *Cyclotella antiqua* Wsm., *Melosira granulata* (Ehr.) Ralfs. and some *Surirellas* are plankton species.

In contrast to the western British lakes, which occur on ancient geological formations at some altitude. Hornsea Mere is a typical shallow lowland lake on a recent formation. The interesting desmid plankton flora of the former is not likely to occur. Owing to the periodicity of plankton organisms a collection in April will not give a complete view. In shallow lowland lakes however, the plankton has many perennial constituents, and in spring a diatom maximum is followed in autumn by a maximum of blue-green algæ. A collection from the Mere in September, 1922, made by B. M. Griffiths contained the following:—Blue-green algæ: *Anabaena Lemmermannii* P. Richter, *Microcystis aeruginosa* Kutz.

The phenomenon of 'water bloom' or 'the breaking of the meres' is attributed to such organisms as these:—Green algæ: *Volvox aureus* Ehr., *Cosmarium Turpinii* Breb.; Yellow-green algæ: *Botryococcus Braunii* Kutz.; Flagellata: *Ceratium hirundinella* O.F.M.

In the published lists there are few planktonic diatoms recorded for the Mere, and it will be interesting to examine the spring dominants. Recorded are: *Stephanodiscus Hantzschii* Grun., *Fragilaria capucina* Desm., *F. construens* (Ehr.) Grun., *Synedra ulna* (Ehr.) var. *Danica*, and many marginal or benthic forms, which may be epiphytes on aquatic vegetation. It seems doubtful whether anything is known about the animal plankton, and this also is a field for discovery. Rotifers, Protozoa, Copepods and other minute crustacea should be plentiful in spring.

MEETINGS.—On Monday a tea will be served at headquarters at 5 p.m. prompt, price 2/- each with meat, or plain tea 1/- each.

A general meeting will follow at 6-15 p.m. to receive reports from the various sections, and at which proposals for new members will be very welcome.

The next excursion will be in V.C.65 at Tanfield on May 11th.

Will members of the Botanical Ecological Section please note that a field meeting is being arranged at Austwick on Whit Tuesday following the Bentham meeting.

Yorkshire Naturalists' Union.

President:

WILLIAM SAWNEY BISAT, F.G.S., North Ferriby, East Yorks.

Hon. Secretary:

CHRIS. A. CHEETHAM, F.R.E.S., Austwick, *via* Lancaster.

Hon. Treasurer:

S. D. PERSY FISHER, Sackville Street, Leeds

Divisional Secretary:

J. HARTSHORN, Leyburn.

The 389th Meeting

WILL BE HELD AT

TANFIELD

for the investigation of the portion of V.C. 65, which lies on the north side of the River Ure in this district.

Saturday, MAY 11th, 1935

THE DISTRICT.—Tanfield is situated on the north bank of the River Ure; the latter forms the southern boundary of the North Riding at this place. Here the river has broken through the last of the rock masses of its course and emerges into the drift-covered area of the York plain. Tanfield is built on the Permian limestone, and here these rocks have some very fossiliferous exposures; in quarries to the north some of the lower beds may usually be found to have plenty of *Productus horridus*, a fossil known to many from the Micklefield area.

Further up the river we come to the gorge cut in the Millstone grit rocks where the scenery is very picturesque, the south bank being the well-known Hackfall district. We are to examine the private grounds on the north, including the far less known area of Magdalen Wood.

BOOKS AND MAPS.—The area is found on Sheet 21 of the one-inch Ordnance Survey; previous Circulars are 122, April, 1896, and 238, June, 1912. Good reports of these meetings are to be found in *The Naturalist*, 1896, p. 193; 1912, p. 246. Many notes on the area will be found in Baker's *North Yorkshire*, Lee's *West Yorkshire*, and Kendall and Wroot's *Geology of Yorkshire*, and also on the birds in Nelson's *Birds of Yorkshire*.

HEADQUARTERS.—The 'Bruce Arms,' Tanfield. Mrs. Wade.

BUS TIMES.—There are no railway facilities nearer than Ripon, but from Ripon Market Place buses leave for Tanfield at 7.5 a.m., 9.5 a.m., 12 noon, 2.30 p.m., taking twenty minutes to make the journey to Tanfield. The bus leaves Tanfield for Ripon at 5.35 p.m., 7.23 p.m., and 10.13 p.m.

ROUTE.—Miss C. Rob will lead the party, leaving headquarters at 10 a.m. They will follow the river to Magdalen Woods, opposite Hackfall.

Members arriving at 12-30 p.m. will take the shorter way *via* Tanfield Lodge and join the rest in the Woods.

Permission to visit portions of their estates have been granted by Mr. W. D. Arton and Mr. C. J. C. Rishworth. We have also been given permission by Mr. R. Heddon to visit the grounds at Messrs. C. Hammond & Co's Mills. Members will please exercise care to avoid disturbing nesting game birds.

VERTEBRATE ZOOLOGY.—Mr. Riley Fortune, F.Z.S., writes :

MAMMALS : Most of the smaller mammals are to be found, including the Badger and Otter, both the Grey and Red Squirrels occur, the latter much rarer than formerly. Of the smallest the most interesting is the Water Shrew and the Bats, of which the Noctule, Pipestrelle, Whiskered, and Daubentons have been identified.

BIRDS : The district is a paradise for birds, and most of our resident species occur. Perhaps the most interesting being, on the river, Kingfisher, Dipper, Grey Wagtail, and Sandpiper. In the woodlands all three Woodpeckers may be seen, also the Nuthatch and Creeper. Birds of prey are, owing to game preserving, kept strictly in check, nevertheless, Kestrels, Sparrowhawks, Tawny, Barn, Long-eared, and Little Owls contrive to rear broods. The Warblers are abundant, and both the Blackcap and Lesser Whitethroat may be heard.

The felling of the big timber in Hackfall has caused some disturbance to bird life.

FISHES.—The waters of the district are strictly preserved. Trout and Grayling are abundant. Salmon ascend in some numbers and the parr are a great nuisance to fly fishers. Pike, Chub, Dace occur, the latter two species in large numbers, and although not vertebrates it may be interesting to note the presence of Crayfish.

REPTILES AND AMPHIBIANS.—Frog, Toad, Common Lizard, Slow-worm, Adder, and Grass Snake, also the three species of Newts.

CONCHOLOGY.—Mrs. Morehouse writes : I have no other data for Tanfield, but the following are from the previous reports of meetings at Tanfield, the generic names being brought up to date :—

Agriolimax lævis.

A. agrestis.

Arion ater.

A. ater v. *circumscriptus.*

A. ater v. *intermedius.*

A. hortensis.

Vitrina pellucida.

Vitrea cellaria.

V. alliaria.

V. pura.

V. radiatula.

V. nitidula.

V. crystallina.

V. rogersi.

Euconulus fulvus.

Sphyradium edestulum.

Helicella virgata.

Hygromia granulata.

H. rufescens.

H. hispida.

H. hispida v. *hispidosa.*

Pyramidula rotundata.

Acanthinula lamellata.

Helix aspersa.

H. nemoralis.

H. hortensis.

Cochlicopa lubrica.

Azeca tridens.

Clausilia bidentata.

Carychium minimum.

Ancylus fluviatilis.

Limnæa pereger.

ENTOMOLOGY.—Previous meetings were not very successful, due in some degree to weather, and also to the early date of meeting, but amongst the Neuroptera and Trichoptera the late G. T. Porritt noted *Chrysopa tenella*, *Perla maxima*, *Chloroperla grammatica*, *Hemerobius micans*, *Leptocerus aterimus*, *Hydropsyche angustipennis*. In the 1896 Circular Mr. J. Carter stated that the Comma Butterfly (*Vanessa c-album*) occurred in the district and that he met a flight of them feeding on the Scabius, and he caught four specimens. Other species mentioned in the older lists are *Eupithecia abbreviata*, *E. tenuiata*, *Xanthia cerago*, *X. silago*, *X. ferruginea*, *Orthosia lota*, *Tæniocampa gothica*, *T. instabilis*.

Mr. E. G. Bayford, F.R.E.S., cited *Leistus spinibarbis* F., *Silpha atrata* L., *Aphodius punctato-sulcatus* Strum., *Sericosomus brunneus* L., *Chrysomela polita* L., and *Staphylinus cæsareus* Ceder.

ARACHNIDA.—Mr. W. P. Winter, B.Sc., writes : During the visit to Tanfield in 1912, Mr. Falconer reported having found fifty-six Arachnids. These were detailed in *The Naturalist* for 1912, p. 251, but were largely common and well-distributed species. The following may be mentioned as of more limited range in the country : *Philodromus dispar*, Walck., *Linyphia hortensis* Lund., *Leptyphantès pallidus* Bl., *Neriene rubella* Bl., *Diplocephalus picinus* Bl., *Metopobactrus prominulus* Cb., and the pseudoscorpion *Chthonius rayi* L.K. The locality is a favourable one for Arachnids and should yield others of greater rarity if careful search were made. Hackfall should prove good for collecting.

BOTANY.—Miss C. Rob, who leads the party, writes : Mr. W. Foggitt in his booklet, *The Botany of Lower Yoredale*, noticed the following plants round Tanfield, along with many others : *Equisetum maximum*, *Festuca sylvatica*, *Gagea lutea**, *Poa*'s, *compressa* and *rigida*, *Helleborus viridis**, *Viola hirta**, *Stellaria nemorum**, *Myrrhis odorata**, *Trollius europæus*, *Atropa belladonna**, *Petasites vulgaris*, the female flowers*, *Salix rubra**. Those marked with a star I have seen myself. Also *Cardamine amara*, *Vinca major* (escaped from cultivation), *Sedum dasyphyllum*, *Agropyrum caninum*, *Schenus nigricans*, *Carex ovalis*, and *Berberis vulgaris*.

At Tanfield Mill are to be found later in the year some very good aliens. In the last three years some of the most outstanding have been : *Delphinium ajacis*, *Sisymbrium sophia*, *Alyssum incanum*, *Saponaria vaccaria*, *Medicago denticulata*, *Melilotus alba*, *Potentilla norwegica*, *Caucalis daucoides*, *Hyoscyamus niger*, *Dracocephalum parviflora*, *Coronella varia*, *Echinosperrnum lappula*, *Bromus arvensis*, *Setaria verticellata*, and *Asphodelius festulosa*. (It is very much too early for aliens, but I think a visit there would be of interest.)

MOSESSES.—The geological features provide an interesting opportunity for studying the bryophytic flora on the Millstone Grit in the river floor in contrast with the Magnesian limestone bed of the river below the bridge. Amongst the many interesting species found in the district are *Tetraphis brownianum*, *Swartzia montana*, *Seligeria doniana*, *Campylostelium saxicola*, *Cynodontium bruntoni*, *Dicranum spurium*, *Pterygophyllum lucens*, *Amblystegium irriguum*, *A. fluviatile*, *Hypnum patentiæ*, *Bryum murale*, *Orthotrichum tenellum*, *Thuidium hystricosum*, *Metzgeria furcata*, *Bazzania trilobata*, and *Pedinophyllum interruptum*.

FUNGI.—Mr. F. A. Mason writes : The river banks between Hackfall and West Tanfield, with mixed woods, Oak and Beech, and adjacent parklands, are very good collecting grounds. C. Crossland, *The Naturalist*, 1912, p. 249, reported fifty-seven species collected in June, but there is plenty of scope for extending the list, especially among the micro-fungi. There are very few records of the Uredines in this district and the vegetation is likely to be sufficiently advanced in May to yield a good number of species. In the pastures *Tricholoma carneum*, which Crossland reported, should be looked for, along with species of *Entoloma* and *Nolanea*. Species of *Morchella*, *Mitrophora*, *Helvella*, and the larger *Pezizas* are likely to be at their best at the time of this visit.

MEETINGS.—Tea will be served at the ' Bruce Arms ' at 4-45 p.m. Plain tea, 1/- ; with meat, 1/9.

A General Meeting will follow at 5-15 p.m. to receive reports from the various sections. We shall be very glad to have proposals for new members at this meeting.

The next excursion will be the Whitsuntide meeting at Bentham, and this will be followed on Whit Tuesday by a meeting of the Botanical Ecological Section at Austwick to visit the Juniper area on Moughton Scar.

Yorkshire Naturalists' Union.

YORKSHIRE NATURALISTS' UNION.

For particulars apply to

*The Hon. Secretary, Chris. A. Cheetham, Austwick via Lancaster ;
or to The Hon. Treasurer, S. D. Persy Fisher, Sackville Street, Leeds.*

This form, when filled up and signed, should be sent to the Hon. Secretary of the Union, accompanied by the amount of the first year's subscription.

The Subscription of 15/- entitles the members to receive the Union's monthly magazine, "The Naturalist," as well as the "Transactions."

Persons related to and resident in the family of a member are admitted as 5/- members, to enable them to attend excursions, but not to receive the publications.

Qualification for Life Membership:—A Donation of 11 Guineas.

.....19.....

[Signature and Titles.]

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.....[Address.]

wishes to become a member of the Yorkshire Naturalists' Union, and will subscribe
FIFTEEN SHILLINGS (15/-) per annum until the end of the year in which written
resignation is given.

(viii)

[Signature of Proposer and Second.]

Elected.....19 at.....

.....Chairman's Signature.

Yorkshire Naturalists' Union.

President :

WILLIAM SAWNEY BISAT, F.G.S., North Ferriby, East Yorks.

Hon. Secretary :

CHRIS. A. CHEETHAM, F.R.E.S., Austwick, *via* Lancaster.

Hon. Treasurer :

S. D. PERSY FISHER, Sackville Street, Leeds.

Divisional Secretary :

RILEY FORTUNE, F.Z.S., Harrogate.

The 390th Meeting

WILL BE HELD AT

BENTHAM

for the investigation of part of Valley of the Wenning and that of the Greeta from the county boundary to Keasden and Burton-in-Lonsdale.

WHIT WEEK-END

SATURDAY, JUNE 8th, to
MONDAY, JUNE 10th, 1935

THE DISTRICT.—Bentham lies on the extreme edge of the county and by confining our activities to Yorkshire territory we shall miss the interesting country drained by the Hindburn, and with it the track of the Roman road which came over Botton Head Fell, past Ivar and Lowgill, crossing the Wenning just beyond Low Bentham Church. We shall include in our excursions that portion of the Greeta Valley which lies down stream from Burton-in-Lonsdale to the county boundary at Old Wennington. The latter must not be confounded with Wennington on the River Wenning below Bentham.

All the district is south of the Craven Fault and away from the limestone country, and it will be very interesting to see the richness of the flowers and trees on this millstone grit area, in contrast to what is usually found on soil of this character in places where our industrial towns have sprung up and altered matters. There is a pleasant road from Keasden to Wray, which is, as yet, unspoilt, although even here the tidying up of the roadmen is more in evidence every year. Here, in springtime, after the coltsfoot has passed, are anemones, bugle, moschatel, cowslips, primroses, violets, woodruffe, and occasional masses of goldilocks, with full rich flowers, not the depauperate petal-lacking type so generally seen ; in damper spots are the deeper colours of the marsh marigold. Mingling with these flowers are the fresh young shoots of the ferns, the scaly variety of the male fern (*Borreri* Newm.) being very striking at this time. New pale green leaves are pushing up amongst the old, now dying, dark green leaves of the Common Polypoddy, Harts Tongue, and Northern Hard ferns. The great variety of the various Willows and their hybrids show catkins of all types. Later on, in odd corners, the Globe flower and Herb Paris may be found. The Early Purple orchid is plentiful, but more striking is the later-flowering Spotted orchid (*O. fuchsii*, Druce). In places hybrids of interesting types may be found between this and the Marsh orchids. The Butterfly orchids (*H. chlorantha* and *H. bifolia*), Clove orchid, Frog orchid, Twayblade, Broad-leaved Helleborine, and Bird's Nest orchid (*Neottia Nidus-avis*) are all to be found along this lane side.

If flower display is sought it will best be found when the Gorse is in bloom and when the Hawthorn, Blackthorn, and Bird Cherry are covered with their snow-white blossoms. The hybrid Geum, the result of the crossing of the Water and Wood Avens, is here with the Marsh Hawk's beard. Two forms of the small marsh Valerian make a striking show in places, whilst the great wild Valerian, the Fleabane, and Sawwort are in the hedgerows. Coming to a later time of the year, when the pale blue bells of the giant bellflower have gone, we find the deep blue of the marsh Gentian and the pale pink flowers of the lesser Skull Cap as rarities for the district. Even in the depth of winter the road has its charm, but then it is the colours of the dying foliage and the varied shades of brown will show which is the Lady fern or the Male fern, the Buckler or the Scented Mountain fern. Oak and Beech ferns must be sought in the wooded ghylls which cross the road here and there. Masses of moss will still keep up the green colour even in winter, *Mnium hornum*, *Hylocomium triquetrum*, *Thuidium tamariscinum*, *Dicranella*, *heteromalla*, and many others helping in this way.

BOOKS AND MAPS.—Bentham is on Sheet 24 of the Ordnance Survey, but Keasden is on No. 25, and Burton on Sheet 19.

REFERENCES.—F. A. Lee's 'Flora of West Riding'; Nelson's 'Birds of Yorkshire'; Kendall and Wroot's 'Geology of Yorkshire,' pp. 273-4-5; 'Y.N.U. Circular,' May, 1898; 'The Goniatic Zones of the Keasden Beck Area,' *The Naturalist*, Oct., 1925.

PERMISSION.—For the Burton area this has been kindly given by Mr. Harvey, of Clifford Hall, Mr. Harrison, of Scaleber, and Mr. A. Stowell, of Lowfields, who has also made the private footbridge available to members on Monday.

HEADQUARTERS.—Wenning Hotel: Mrs. Townson. Terms 9/- per day. Will members state if agreeable to share room.

TRAVEL FACILITIES.—Train, Leeds 8-3 a.m.; Bradford 8-33 a.m.; due Bentham 10-32 a.m. Return 7-50 p.m. Buses *via* Ingleton are available from all parts.

EXCURSIONS.—The party will leave headquarters at 10-30 a.m. Saturday and go upstream on the south side to Mewith; the geologists will get to Keasden and return by the 7 p.m. train from Clapham Station. On Sunday directions will be left at headquarters as to the whereabouts of the various sections. On Monday the bus will be taken to Burton-in-Lonsdale, then walk downstream on south side to the private bridge at the county boundary, returning by the north bank.

GEOLOGY.—Mr. John Holmes writes: The 1-in. Geological Survey Map, 'Settle,' Sheet 93, N.W. (New Series, Sheet 60) covers most of the area to be visited. The Survey Memoir 'Ingleborough' and 'The Description of the Model of Ingleborough' contain valuable information about the Craven Faults and the Ingleton Coalfield.

The area to be investigated lies between the Clapham—Slaidburn road and the western boundary of the county. South of the River Wenning, Burn Moor rises steeply to over 1,300 ft. O.D., while undulating country occupies the region northward to the valley of the Greeta and the Craven Faults.

Geology.—The solid geology consists of Carboniferous rocks with a small patch of Permian, the Ingleton Brockram. Millstone Grits and Shales occupy the southern portion and dip under the Coal Measures north of the Wenning. The Brockram overlies the Coal Measures in the extreme north. Throughout the area the beds dip in a northerly direction towards the Craven Faults. The shales in Keasden Beck have received some attention from members of the Union, but the exact horizon of the grits and shales which disappear under the Coal Measures has not yet been determined. Additional records to the flora and fauna of both Millstone Grit and Coal Measures are desired. Extensive deposits of glacial material occur in the valley of the Wenning and a study of 'erratics' may throw light upon the movement of local glaciers.

Reprint of Supplement to Circular of the 136th Meeting at Clapham.

GEOLOGY OF BOWLAND KNOTTS.—Mr. R. H. Tiddeman, M.A., F.G.S., writes that the geology which may be met with from Clapham southwards is all contained in the Geological Survey Map, Sheet 92 N.W. (new

series Sheet 60) which may be had either coloured for solid rocks only or for drifts as well. The solid rocks edition is the best to get for the geology generally, as so much of the detail is lost in the drift colouring. A horizontal section, No. 147, from Heysham to Settle, also relates to this ground. The distance from the Clapham station to Bowland Knotts is under five miles, a fairly direct mountain road but all against the collar. The ground passed over consists entirely of beds of Millstone Grit and associated shales. These are much broken by a series of faults, which range from W.N.W. to N.N.W. It would be difficult to make out the arrangement of these rocks were it not for the clues afforded by two fairly distinct beds: (1), Black Fossiliferous Shales, containing *posidonie* in chief abundance, *orthoceras*, *goniatites*, occasionally fish scales and teeth, and fragments of fossil plants; (2), The sandstone below this is remarkable for being a hard siliceous rock (almost a *ganister*). A few feet below the top of this there is often a thin bed of coal, which may be found by poking about under the beds of sandstone. It is generally found in a pool in the stream. At a lower level at the bottom of the grit or a little below it, is often a bed of coal of better proportions, ranging about 1-ft. 10-in. to 2-ft. 0-in. This has been extensively worked by level and crop works, not so much here as on the extension of the outcrop westwards towards Lancaster (91 N.E.). It has been worked near Wray, Hornby, Farleton, and Caton, and in the valley of the Conder, and generally goes by the name of the Caton Coal. Like most of the Millstone Grit coals, it is inconstant in thickness, and often probably absent or reduced to a mere trace. The shades mentioned above may be known on the map by the green colour given them. The geology is not to be plainly seen along the road, but Keasden Beck on the west, and Kettlesbeck from 1 to 1½ miles east of the road, give very good sections and are pretty little glens, although there are not, so far as I recollect, any footpaths along them. Another smaller and shorter gill which runs down by Throstle Nest and is close to the road, gives a fair exposure of the Fossiliferous Shales, and shows the Coal Grit thrown up by a small fault. At Dovenanter End a small vein of galena was tried many years ago. In Kettlesbeck, right bank, between the railway and Kettlesbeck Bridge, a calcareous bed was found containing *Productus* and *Spirifer*, a very unusual fauna in these Millstone Grits. This is a higher horizon than that of the Fossiliferous Shales above the Caton Coal Grits. A trace of it was also found in the road as it crosses the hill S.W. of Dubgarth.

DRIFTS.—The peaty flats about Clapham wander about amongst numerous drumlins, old ice-sheet rubbish. The north end of Burn Moor is covered with a spread of drift and here and there little ridges, which are evidently the moraines of dwindling glaciers coasting the fell, present themselves. Occasionally Silurian boulders are found here, which probably came from Ingleton, or the other older foundations of the Ingleborough range. Drift is to be found high up on the ascent to Bowland Knotts. Glacial striæ on the rocks, especially on the fine surface of the Coal Grit, are common, and I have found scratched surfaces with overlying boulders on the Knotts themselves. These scratches are striking for Pendle, and show that an ice-stream crossed the ridges at an elevation of about 1,400 ft.—(See *Evidence for an Ice-Sheet in N. Lancashire, Yorkshire, and Westmorland*, by R. H. Tiddeman, Quart. Journ. Geol. Soc., pp. 471-491, 1872).

VERTEBRATE ZOOLOGY.—Mr. H. B. Booth, F.Z.S., writes: Bentham is a good centre for the birds of the moorlands and the mountain streams. Such birds as the Curlew, Golden Plover, Redshank, Snipe, Common Sandpiper, Ring Ouzel, and Wheatear should be seen in numbers. On the surrounding moors are nesting stations of the Black-headed Gull, and they are favourite nesting sites of the Teal. The much rarer Garganey has been known to nest there during recent years. Nests of the Dunlin, Merlin, and even the Short-eared Owl, may possibly be found; and Ravens and perhaps the Peregrine Falcon may be seen passing over.

Careful enquiries should be made about the 'Winter Roosts' of the Rook in the neighbourhood, which is not definitely known. I strongly suspect a wood to the south-west of Bentham, and just within the county boundary, as being one, but I have never visited it.

Little is known of the mammals, etc.,

The Long-eared Bat occurs, but any other species of bat captured will be of value. The Wenning is a favourite resort for anglers and good catches of Trout and Salmon Trout are made in the season.

At Burton the Buzzard may be seen occasionally and amongst others the Hawfinch and the Long-tailed Tit are spoken of by residents.

ENTOMOLOGY.—The plentiful Holly trees provide a home for the Holly Blue Butterfly (*Lycaenopsis argiolus* L.), in this area the Meadow Brown Butterfly (*Maniola jurtina* L.) is plentiful, whilst at Austwick, eight miles to the east, it is rarely seen, though the reason is difficult to find.

Mr. Rosse Butterfield, F.R.E.S. writes :—**LEPIDOPTERA.**—A look-out should be kept for the Green Hairstreak, *Thecla rubi*. This Butterfly, which occurs in the district adjoining, has spread and multiplied during the past few decades in West Yorkshire. It frequents Bilberry areas.

The Fox Moth, Emperor, Wood and Ruby Tiger Moths should have emerged at the time of the nesting. Among other May Moths of the district are : *Sesia bembeciformis*, *Asthena luteata*, *A. candidata*, *Scodonia belgaria*, *Cabera pusaria*, *Macaria liturata*, *Panagra petraria*, *Fidonia atomaria*, *F. pinaria*, *Melanthia ocellata*, *Melanippe galiata*, *Coremia propugnata*, *C. ferrugata*, *Cidaria corylata*, and *C. russata*. It is not too late for the species of *Toeniocampa*. **HYMENOPTERA.**—The district is a good one for the genus *Bombus* and its varieties. Some of the species seem to vary in colouration according to vertical range. *B. terrestris*, var. *lucorum* is almost dominant in some parts, and var. *virginalis* is fairly common. *Psithyrus distinctus* is the main inquiline on this species in North-west Yorkshire. On the lower slopes of the hills *B. latreillellus*, var. *distinguendus*, Mor., is not uncommon. It is a fine variety easy to recognise. *B. soroensis* is found in the area surrounding, and I believe it has not been found except in West Yorkshire. *B. lapponicus* occurs in the heather and Bilberry areas. It is a late bee and queens frequent the lowlands at this time. The carder bees are well represented, and vary a good deal in colouration. Of the red tailed bees *B. raiellus* is common in some seasons.

It is probably the best time of the year for the genus *Andrena*, and the following occur : *A. cineraria*, *analis*, *helvola*, *lapponica*, Zett., and *clarkella*. *Nomada lathburiana* associates with *A. cineraria*, and *Romada ruficornis*, *bifida* and *ochrostoma* with those of the *lapponicus* type. Near Keaden, Mr. C. A. Cheetham has taken *N. solidaginis*, an inquiline on *Andrena fuscipes* which burrows on sandy heaths.

BOTANY.—Little has been published on the district but a few references from Lee's Flora of the West Riding are interesting, confirmation would be helpful for, *Thalictrum majus* Sm. var. *flexuosum* Reich., *Hypericum Androsæmum* L., *H. dubium* Leers., *Conium maculatum* L., *Silva pratensis* Bess., *Hieracium tridentatum* Fries., *Verbena officinalis* L., *Orchis Morio* L., *O. ustulata* L., *Convallaria majalis* L.

MOSES.—In some of the streams running down from the moors on the South, typical gritstone stream species like *Catharina crista* James, and *Hypnum ochraceum* Turn. var. *flaccidum* Milde are found and on the sandy road edges *H. patientia* Lindb., occasionally the walls are found plentifully covered with *Barbula revoluta* Schwg. and *Diselium nudum* Brid. appears in varying quantity yearly on damp shaly banks. *Tetraphis Browniana* Grev. should be sought for as it is known in the district. The large celled *Pterygophyllum lucens* Brid. will be found also the very infrequent *Pylaisia polyantha* B. and S.

In the woods near Burton-in-Lonsdale, three minute species *Seligeria recurvata* B. and S. *Brachyodus trichodes* Fuernr. and *Campylostelium saxicola* B. and S. occur near together whilst close at hand are large masses of *Weisia verticillata* Brid. fruiting and pointing to a plentiful supply of lime in the water though we are away from the limestone area, near at hand on the sandstone rock is *W. tenuis* C.M. and *Fissidens crassipes* Wils. is noted by Wilson and Wheldon as in the Greeta.

MEETINGS.

Tea will be served at the Wenning Hotel, at 6-30 p.m., on Monday. Plain tea 1/3, with meat 1/9.

A General Meeting will follow at 7 p.m., to receive reports from the various sections. At this meeting we shall be very glad to have the names of those desirous of joining the Union.

On Tuesday, June 11th.—Those who wish to join the Ecological Section in the Moughton area will leave Bentham by the 10-30 a.m. bus to Austwick.

The next Excursion is at Langsett, on July 6th, 1935.

Yorkshire Naturalists' Union.

President :

WILLIAM SAWNEY BISAT, F.G.S., North Ferriby, East Yorks.

Hon. Secretary :

CHRIS. A. CHEETHAM, F.R.E.S., Austwick, *via* Lancaster.

Hon. Treasurer :

S. D. PERSY FISHER, Sackville Street, Leeds.

Divisional Secretary :

JOHN GRAINGER, M.Sc., Ph.D., Tolson Museum, Huddersfield.

The 391st Meeting

WILL BE HELD AT

PENISTONE

For LANGSETT

and for the investigation of the upper waters of the Little Don
and Harden Moor, on

SATURDAY, JULY 6th, 1935

TRAIN SERVICE.—Members should consult their local guides and meet outside Penistone Station at 10 a.m.

A bus leaves Penistone for the Flouch Inn at 9.32 a.m. and hourly (32 minutes past the hour) afterwards. The return bus leaves the Flouch at 23 minutes past the hour throughout the day.

ROUTE.—The party will travel by the bus (near the Church) to the Flouch Inn. Opposite the inn is the entrance to the field path across to the reservoir (right hand side) which holds the impounded waters of the Little Don ; this is the entrance to the area chosen for investigation.

PERMISSION.—Permission to visit the area has been kindly given by Sir T. E. M. Pilkington and the Corporation of Sheffield.

THE DISTRICT to be investigated is about 4,000 acres of moorland drained by the streams feeding the Little Don (or Porter as the map alternatively gives it). There are numerous small valleys in which the geological strata are exposed. After entry by the reservoir the valley immediately to the right should be taken.

BOOKS AND MAPS.—The one-inch Ordnance Survey, Large Sheet Series 36 covers the area, and Y.N.U. Circulars 98, July, 1892, and 308, July, 1923, deal with the neighbouring district, and a report of the 1923 meeting is to be found in *The Naturalist*, 1923, pp. 340-344. Lee's *West Yorkshire Flora*, Nelson's *Birds of Yorkshire*, Kendall and Wroot's *Geology of Yorkshire* will be found useful.

GEOLOGY.—Mr. W. S. Bisat writes : I have no first-hand knowledge of the area. Langsett itself lies on the junction between the Lower Coal Measures (on the north-east) and the Millstone Grits (to the south-west). The nature of the outcrops is well seen on the one-inch Geological Survey map of Glossop (Sheet 86), published in 1932. Outcrops of the Rough rock skirt both sides of Langsett Reservoir, whilst further to the south-west are

outcrops of the Huddersfield White Rock, the Beacon Hill Flags, the Rivelin Grit, and the Kinderscout Grit. Exposures of the strata at these horizons to the north-west and south-east, in the Dunford Bridge-Holme area and the Ewden Valley, have yielded fossiliferous horizons containing goniatites varying from *Reticulocera reticulatum* mutation α to mutation γ and possibly marine bands yielding similar fossils may be found to the south-west of Langsett.

VERTEBRATE ZOOLOGY.—Mr. Ralph Chislett writes: The birds of the Langsett area are largely of moorland types. Sandpipers should have young by the streams and reservoirs, and Dippers be feeding second broods. Grey Wagtail and Kingfisher should both be noted.

On the moorland marshes the presence of well-grown young Curlews will be evidenced by the cries of the old birds. Young Snipe will mostly be well-grown, though I have known eggs on July 6th. Lapwings will be forming into flocks of family parties. On the hillsides Ring-ousels may have second broods, and the Merlin may be noted. A sharp look-out should be kept for the Dunlin, both by the reservoir and on the moors above—the species certainly breeds a very few miles away. Golden Plovers should be heard, their young should be able to fly. Brown, Long-eared, and Barn Owls are not uncommon, and the Short-eared Owl is a possibility. But neither the moors nor the valleys are noted for rarities, although the species usually associated with such ground will be present in good numbers.

BOTANY.—Mr. W. E. L. Wattam writes: This long and by no means wide valley yields a typical flora of the Millstone Grit area of South-west Yorkshire. The valley bottom has as ground flora of grass heath associates *Deschampsia*, *Nardus*, *Calluna*, and Bilberry. Other occupants are *Galium uliginosum* L., *Ranunculus flammula* L., *Myosotis palustris* With., *Cardamine amara* L., and *Prunella vulgaris* L. The higher portions have an association of *Calluna*, *Ericas*, *Empetrum*, Bilberry, *Deschampsia*, and *Agrostis*. The swamp areas will yield *Hydrocotyle vulgaris* L., Marsh Thistle, immense zones of *Juncus effusus* L., *J. uliginosus* Sibth., *Eriophorum angustifolium* Roth., *Carex flava* L., and *Molinia*. Other plants which occur are *Vaccinium oxycoccus* L., *V. vitis-idaea* L., *Hypericum humifusum* L., *Narthecium ossifragum* Huds., and *Festuca ovina* L. A strict look-out should also be kept for *Arctostaphylos Uva-ursi* Spreng.

There is also a glorious wealth of ferns of the species, Male, Lady, Hay-scented and Northern Hard.

BRYOLOGY.—Mr. F. E. Milsom writes: The district to be surveyed is a typical piece of Millstone Grit moorland, watered by a fair-sized stream and numerous rills feeding the main stream, the elevation varying between 1,000 ft. and 1,600 ft. Typical of such a district will be found *Catharinea crispa* James, *Oligotrichum hercynicum* Lam., *Orthodontium gracile* Schwaeg. var. *heterocarpum* Wats., *Hypnum ochraceum* Turn., and var. *flaccidum* Milde, and *Alicularia compressa* (Hook.) Nees. *Tetraphis Browniana* Grev. should occur, and *Blasia pusilla* should be looked for. In addition to the foregoing, the rarer varieties of the common species are worth searching for. They include *Dicranella heteromalla* Schp. var. *interrupta* B. & S. and var. *sericea* Schp., *Alicularia compressa* (Hook.) Nees. var. *rigida* Lindb., *A. scalaris* (Schr.) Corda var. *procerior* Schiffn., and var. *distans*, *A. Geocyphus* De Not. var. *suberecta* Lindb., *Lophozia Floerkii* var. *Naumanniana* Nees.

LICHENS.—Mr. Wattam writes: The typical species which denizen our South-west Yorkshire Moors will be found; *Atraria aculeata* Fr. and *Cladina sylvatica* Nyl. still flourish in small patches. Other interesting species are *Evernia furfuracea* Fr. and its var. *ceratea* Nyl., *Platysina glaucum* Nyl., *Baeomyces rufus* D.C., several *Cladonias*, *Lecidia granulosa* Schaer. and *L. uliginosa* Ach. A full list of the species noted by me during the excursion in 1923 will be found in *The Naturalist* for that year, page 343.

HEADQUARTERS.—The Bridge Hotel, Penistone (Proprietor, Mr. Frank Marsh).

Tea will be taken at 5-45 p.m. Meat Tea, 2/-; Plain Tea, 1/3.

GENERAL MEETING to receive reports will follow the tea and proposals for new members will be gladly received at this meeting.

The next meeting will be in the north-east Vice-County and will be held at Hovingham Spa on August 3rd-5th, 1935.

This will be followed by the Fungus Foray at Helmsley, August 31st-September 4th, 1935.

Yorkshire 'Naturalists' Union.

President:

WILLIAM SAWNEY BISAT, F.G.S., North Ferriby, East Yorks.

Hon. Secretary:

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S. D. PERSY FISHER, Sackville Street, Leeds.

Divisional Secretary:

G. B. WALSH, B.Sc., Stepney Drive, Scarborough.

The 392nd Meeting

WILL BE HELD AT

HOVINGHAM

for the investigation of the wooded country lying near the village and of the quarries in the district

August Bank Holiday week-end

SATURDAY, AUGUST 3rd, 1935
TO
MONDAY, AUGUST 5th, 1935

TRAIN SERVICE.—The best way to get to Hovingham is by train to Malton and then by West Yorkshire bus, these leave Malton (Market Place) at 7-5 a.m., 9-50 a.m., 12-5 p.m., 2-5 p.m., 4-50 p.m., 6-35 p.m., 7-35 p.m., 9-35 p.m., taking 23 minutes to do the journey. Return bus leaves Hovingham at 1 p.m., 3 p.m., 6 p.m., 7 p.m., 8 p.m., 10 p.m., these all arrive at Malton Station 37 minutes past the hour. On Sundays the service out is 10-35 a.m., 2 p.m., 5-35 p.m., 7-35 p.m., 9-35 p.m., and back 11 a.m., 2-25 p.m., 6 p.m., 8 p.m., 10 p.m. The fares are 9d. single, 1/3 return.

THE DISTRICT.—Mr. Geo. B. Walsh, B.Sc., writes:—The country is well-wooded and pleasantly diversified, with chalk hills, lowland valleys, streams both swift-flowing and slow, a small patch of peaty country, and another of marsh, while heather moors are within easy reach for those who have cars. There is much of historic interest in the vicinity. There are many barrows, some of which have been opened, and the village lies near

to the old Roman 'street' running into Malton. Remains of a Roman villa have been found, near to the mineral springs which give the village its second name, but the springs have been neglected and have almost silted up. The Hall, the residence of Sir Wm. Worsley, dates from about 1740, but was never completed. The old Manor House is now the Manor Farm, near which the old type of cultivation still shows in some of the fields. The Church has a Saxon tower with herring-boning, and one Norman doorway, but has been badly renovated; inside there is a carved stone depicting the Annunciation. Slingsby, two miles away, has the ruins of a castle, blown down by Cromwell, and the Church will well repay examination. Castle Howard, too, is within easy reach.

There are many fine trees in the woods and a fine yew hedge near the Hall, and the district is most promising. Unfortunately, with the exception of the botany and geology, very little work seems to have been done in the natural history of the district, so that the district is almost unknown country to the Union.

HEADQUARTERS.—Mr. G. Fitzroy Lloyd, Worsley Arms Hotel, Hovingham, York. Terms: Bed, breakfast, sandwiches, and dinner, 10/6 per day, no extras. A garage is available at the hotel, 1/6 per night. It will be advisable to make early application as accommodation is limited.

REFERENCES.—Sheet 22, 1-in. Ordnance Survey, covers the area. J. G. Baker's *North Yorkshire* and the *Victoria County History* are useful books for references and *Ryedale*, published by the Council for Preservation of Rural England and edited by Col. C. W. E. Duncombe, C.B.E., deals with the district.

Saturday.—Through the Park, foot of Stocking Hill, by the Rifle Butts, low side of wood to old nursery, Stocking top, Black fir, back by road (3 miles).

Sunday.—By sawmill, past Woolknoll, to Lodge, back by road (2½ miles).

Monday.—Prospect Hill, York Road, Middle Way, South Wood, Skitscrew, Melbecks, Wath, back by high road (4 miles).

Mr. W. J. Moore, of Hovingham, who has suggested the above excursions, hopes to be present in person.

PERMISSION.—This has been given by Sir Wm. Worsley, Hovingham, and by Mr. J. Wray, on behalf of the Seamer Lime Co., who has instructed his men to put aside any fossils they may meet with at the time of our visit.

GEOLOGY.—Dr. Vernon Wilson writes:—Hovingham is located at the foot of the northern flank of the Howardian Hills where the Vale of Pickering, by the effect of two powerful E.-W. faults, becomes constricted in the south west into the Coxwold-Gilling Gap. The hill slopes to the south and south-east of Hovingham are composed of undisturbed Corallian rocks which have a low dip to the N.N.E., the following subdivision of these rocks are present:—

- | | | |
|----------------------------|---|--------------------|
| 2. Osmington Oolite Series | { | Coral Rag. |
| | | Oolite Limestones. |
| 1. Lower Calcareous Grit. | | |

The Lower Calcareous Grit is a fine-grained gritstone which, in Potticars Wood Quarry, one mile south of Hovingham, is highly siliceous due to the abundance of the globate spicules of *Rhaxella perforata* Hinde; elsewhere, the gritstone is more calcareous, being frequently termed 'bluestone,' this facies is exposed in the park close to the point where the road crosses the stream.

The oolite limestones and overlying Coral Rag are exposed in numerous quarries south-east of the village and in the Park. The oolites are remarkably

pure and frequently devoid of fossils but the Coral Rag carries a large suite of fossils wherever it is seen. The Coral Rag forms part of a reef mass in this locality and it is seen to advantage in the Hovingham Lime Quarry and in an exposure in the low hill on the north side of the stream running through the Park.

A small area of Kimeridge Clay has been mapped in the Park but no exposure is to be seen. The gritstones and limestones noted above constitute the parkland and wooded hills to the south west of the village but the relations of these rocks are hereabouts complicated by local faults.

(For further details and lists of fossils, see the writer's paper 'The Corallian Rocks of the Howardian Hills,' *Quart. Jour. Geol. Soc.*, 1933, Vol. LXXXIX, pp. 480-509.)

Rev. Geo. H. Richardson, Ph.D., Sc.D., The Rectory, Oswaldkirk, kindly invites any geologist who is interested to see his collection of American fossil remains—jaws and teeth of the little three-toed horse *Eohippus*; *Bothrio lepis*; *Smilodon* skull from the tar pits of Rancho la Brea; marine reptile fossils from Kansas, etc.

Dr. Richardson writes:—The geologist and palæontologist visiting Hovingham and neighbourhood will find their time profitably spent, and with the minimum of effort.

Here, and stretching to Malton, spreads the Osmington Oolite Series. At Hovingham are the oolite limestones measuring 26 feet and overlaid by the Coral Rag measuring 14 feet, this latter being very fossiliferous. Along the road from Hovingham to Malton, and invariably on the right side of the road, is a series of quarries easy of access, and a similar fauna is found in each. Beginning at Hovingham one should enter the Hovingham Limestone Quarry from the Malton road by the short path just outside the village, for here one has to pass over a fine bed of coral from which beautiful specimens may be easily taken. The whole of the upper part of the quarry, measuring five to six feet, has proven a fine place for *lamellibranchs* and *gastropods*, while in the lower part *echinodermata* are found in abundance.

At Wath is a small quarry well worth visiting, for here splendid *gastropods* are to be found. To the east of Mr. Cundill's home, and in his field, is still another quarry not to be seen from the road, and while not so fossiliferous is still worth visiting.

Half-a-mile east of Slingsby is a very fossiliferous quarry.

At Appleton-le-Street, on both sides of the Church, are quarries in which fossils are plentiful.

There is also a quarry at the White Cottages in Stonegrave parish, where rare but good ammonites have been found, as well as other fossils, including good belemnites.

In the Nunnington railway-cutting one finds the Osmington Oolite Coral Rag overlaid by the Upper Calcareous Grit, and here are to be found *Montlivaltia dispar*, *Thecosimilia annularis*, *Cidaris florigemma*, *Exogyra nana*, *Chlamys matheimensis*, *Pseudomelania heddingtonensis*, etc., etc. Many of the corals, and the nucleolites of Hovingham are very easily cleaned with simple tools.

VERTEBRATE ZOOLOGY.—Mr. P. L. Russell, of Malton, says the red squirrel used to be plentiful here, but others mention the occurrence of the grey squirrel. By the streams, the Kingfisher, Heron, and other water birds occur, some nesting in the pool above the mill. All records will be of value.

In Nelson's *Birds of Yorkshire*, Hovingham is mentioned in connection with the Stonechat, Chiffchaff, Long-tailed Tit, Nuthatch, Pied Flycatcher, and Greenshank.

ENTOMOLOGY.—Very little seems to have been done in entomology. Mr. P. L. Russell says that he has found the Wood White (*L. sinapis*),

Small Pearl-bordered Fritillary (*A. selene*), and the Small Copper (*P. phloea*); the Old Lady (*M. mauva*), the Cinnabar (*E. jacobaeae*), and many other Lepidoptera at Hovingham. The woods are quite close to the village, and, given a favourable night, sugaring near the Sawmill should yield good results.

In the *Victoria County History* the late G. T. Porritt gave a long list of species of Neuroptera and Trichoptera from Castle Howard. Hovingham is a very similar type of place and quite near and may hold the same fauna; among the Dragonflies Mr. Porritt cites *Calopteryx virgo* and *C. splendens*, *Ishnura elegans*, *Agrion pulchellum*, and *A. puella*, *Enallagma cyathigerum*.

BOTANY.—FLOWERING PLANTS. The first extensive catalogue of Yorkshire plants was the fruit of the researches of Robert Teesdale in the Castle Howard neighbourhood, it was read in 1792 before the Linnean Society.

Mr. Walsh writes:—The best account of the botany of the district will be found in Baker's *North Yorkshire*. He says: 'This Howardian tract furnishes a great variety of situation, and although it has none of the more decidedly montane plants, yet we obtain here as many of the rarer species as are to be found anywhere in North Yorkshire within an equal area, with the exception of Upper Teesdale.'

Reference should be made to the long list of notable flowering plants, ferns, and mosses which he gives on pp. 208-9.

Among plants mentioned from about Hovingham are: *Trollius europaeus*, *Actaea spicata*, *Hypericum montanum*, *Picris hieracioides*, *Carduus eriophorus*, *Campanula glomerata*, *Salvia verbenaca*, *Thymus chamædrys*, *Trientalis europæa*, *Lysimachia nummularia*, *Epipactis palustris*, *Orchis pyramidalis*, *Allium oleraceum*, *Bromus erectus*, and *Brachypodium pinnatum*.

Whilst from the Howardian area others are given which might be expected at Hovingham including: *Radiola millegrana*, *Geranium sanguineum*, *Astragalus glycyphyllos*, *A. hypoglottis*, *Ornithopus perpusillus*, *Vicia sylvatica*, *Spiræa filipendula*, *Rubus saxatilis*, *Calamintha acinos*, *Gagea lutea*, and *Melica nutans*.

In the *Victoria County History* the list of plants from this Howardian area shows a great many other rare and interesting species but not their particular localities.

BRYOLOGY.—The mosses and hepatics of the Castle Howard district were the plants which provided Dr. Richard Spruce with the commencement of the vast collection and knowledge of these plants which he later developed, first in Teesdale, then the Pyrenees, and later on the banks of the Amazon. Spruce was a native of the Howardian country and he made the district classic ground for these plants. Hovingham has everything necessary to produce a similar flora but as Spruce spent a lifetime on his area we cannot expect to see more than a few species in the time available. In Baker's *North Yorkshire*, *Thuidium recognitum* and *Brachythecium albicans* are mentioned from Hovingham, whilst from the Howardian track *Cylindrothecium concinnum*, *Cryphaea heteromalla*, *Neckera pumila*, *Camptothecium nitens*, and *Hypnum crista-castensis* are interesting mosses, whilst a possible swampy area may still provide us with a new locality like the lost Terrington Car with *Thuidium blandovii* and *Paludella squarrosa*.

MEETINGS.—Tea will be served at the Worsley Arms Hotel at 5-30 p.m. on Monday. Meat Tea, 2/6. Plain Tea, 1/6.

A **General Meeting** will follow at 6 p.m. to receive reports from the various sections and when we shall be glad to have proposals for new members.

The **Next Meeting** will be the Fungus Foray at Helmsley, August 31st to September 4th, 1935.

The **Annual Meeting** will be at Sheffield, December 7th, 1935.

Yorkshire Naturalists' Union.

President :

WILLIAM SAWNEY BISAT, F.G.S., North Ferriby, East Yorks.

Hon. Secretary :

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The 393rd Meeting

OF THE

YORKSHIRE NATURALISTS' UNION

WILL BE THE

FUNGUS FORAY

AT

HELMSLEY

From Saturday, August 31st, to
Wednesday, September 4th, 1935

Chairman of the Mycological Committee :

MISS D. HILARY, B.Sc.

Hon. Secretary, Mycological Committee :

Dr. J. GRAINGER, Ravensknowle, Huddersfield.

HEADQUARTERS.—Castle Private Hotel (Proprietor : Mr. J. Sample). Terms : 10/- each per day for bed, breakfast, sandwiches, and dinner. Other accommodation at the Crown Hotel. Same Terms.

BOOKS AND MAPS.—The district is covered by Sheet 22 of the 1-in. Ordnance Survey and members may refer to Baker's *North Yorkshire Flora*.

EXCURSIONS.—Saturday, August 31st, Duncombe Park, particularly the woodland part.

SUNDAY.—No excursion has been arranged, but it is suggested that the valley of the Rye could be visited at this time.

MONDAY.—Rievaulx and the neighbourhood.

TUESDAY.—Beckdale.

MEETINGS AND LECTURES.—The Annual Meeting of the Committee will be held at Headquarters on Saturday, August 31st, at 8 p.m. The Presidential Address by Miss D. Hilary, B.Sc., will be entitled "Some Recent Additions to our Knowledge of Reproduction in the Fungi" and will be delivered immediately after the meeting.

Mr. T. Petch, B.A., B.Sc., will lecture on 'Melanospora,' this being the third of his series of lectures on the Hypocreaceae.

A Public Lecture entitled 'Fungi of Garden and Farm' will be delivered by Dr. J. Grainger at the Methodist School, Helmsley, on Monday evening, September 2nd, at 7-30 p.m.

BOOKS, MICROSCOPES, and SPECIAL STUDY.—The attention of members is drawn to the early date of the Fungus Foray. This has been arranged so that teachers may attend the meeting with greater convenience. Those attending the Foray should bring a microscope and books for the determination of species.

YORKSHIRE NATURALISTS' UNION.

For particulars apply to

The Hon. Secretary, Austwick, via Lancaster; or to the Hon. Treasurer, S. D. Persy Fisher, Sackville Street, Leeds.

.....19.....

.....[Signature and Titles.]

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wishes to become a member of the Yorkshire Naturalists' Union, and will subscribe FIFTEEN SHILLINGS (15/-) per annum until the end of the year in which written resignation is given.

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..... } [Signature
of Proposer
and
Seconder.]
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The 394th Meeting

and 74th Annual Meeting

WILL BE HELD AT

SHEFFIELD

On Saturday, December 7th, 1935

The Annual Meeting of the Union will be held in Sheffield University by the kindness of the Council of the University who have placed the Firth Hall at our disposal and of the Sorby Natural History Society who have

invited us to a *Conversazione* and Refreshments in the Biological Department of the University where exhibits will be prepared by the Department and members of the Sorby Society.

TRAVEL FACILITIES—Trains leave Sheffield for :—

Darlington. 10-16 p.m. L.M.S.

Halifax. 9-36 p.m. L.M.S.

Halifax. 9-40 p.m. L.N.E.

Huddersfield. 9-36 p.m. L.M.S.

Huddersfield. 9-40 p.m. L.N.E.

Hull. 9-18 p.m. L.M.S.

Hull. 9-0, 10-55 p.m. L.N.E.

Leeds. 9-43, 10-4 p.m. L.M.S.

Manchester (London Road). 9-48 p.m. L.N.E.

Manchester (Central). 8-29 p.m. L.N.E.

Manchester (Central). 8-35 p.m. L.M.S.

Skipton, Bradford. 8-29, 9-29, 9-43 p.m. L.M.S.

Wakefield. 9-43 p.m. L.M.S.

York. 9-0, 10-9, 10-55 p.m. L.N.E.

York. 9-18, 10-4 p.m. L.M.S.

Members will please check these in case of alterations.

PROGRAMME :—

2-0 p.m. **Sectional and Committee Meetings.**

2-30 p.m. **Executive Meeting.**

3-0 p.m. **General Committee Meeting.**

4-30 p.m. **Tea** (to be taken in town).

5-45 p.m. **Reception.**

6-0 p.m. **Annual Meeting and Presidential Address** on "The Drift Succession in Mid and East Yorkshire."

7-0 p.m. **Refreshments.**

7-30 p.m. **Conversazione.**

Will members of the **Executive** and of the **General Committee** take note of the above times as no further notice of these meetings will be sent out.

Will members of the Biology Section please note that their **Annual Meeting** will be held at 2 p.m. as above, when the various officers and committees will be nominated and the report considered.

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